WILL YOUR CRUSHERS *Do This?*

HANDLE LARGER ROCK

REDUCE TO DESIRED SIZE IN ONE OPERATION

BETTER CONTROL OVER SIZE OF PRODUCT

MAKE CUBULAR STONE NO SLIVERS

25% TO 75% LESS INVESTMENT CHEAPER CRUSHING

ONLY ONE CRUSHER NEEDED FOR THE JOB

THE "SLUGGER" crushes ONE MAN size rock to 1¼"—¾" or agricultural limestone in One Operation. By reducing large stone to these sizes in one operation the "Slugger" has enabled operators to produce these sizes at a low cost per ton and with small investment. Built in Seven Sizes—6 to 150 tons hourly capacity.

THE "JUMBO" crushes ¾ yd. to 1¼ yd. Power Shovel Loaded Rock to 1¼" in ONE OPERATION. By doing all the work in one operation with one crusher there is a big reduction in the costs of foundations, drives and building, as well as power requirements. Six Sizes—50 to 300 tons hourly capacity.

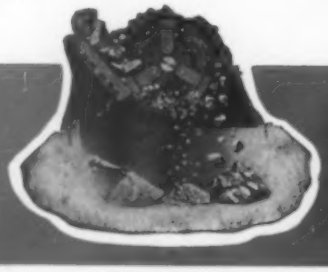
FOR a secrusher for reducing 8" stone to 1", 1¼" or agricultural limestone the Williams "HT" type is the most efficient and economical on the market.

FOR handling wet, muddy rock the Williams "NON-CLOG" cannot be surpassed. Pushing rams prevent material from clogging.

Write today for additional information on any of the above crushers

Open view of Williams "Slugger" crusher showing Heavy duty hammers, liners and discs.

Sectional view showing Williams Hammer Principle of crushing.



THE WILLIAMS PATENT CRUSHER & PULVERIZER CO.

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PATENT CRUSHERS GRINDERS SHREDDERS

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2. Strength and Simplicity. Riveted frame, strong brackets and sturdy rolls make a trouble-free assembly. No bolts or nuts to work loose.

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4. Belt Protection. Idlers are smooth with rounded edges. Narrow gap between rolls prevents pinching.

5. Accurate, Balanced Rolls. Accurate machining assures perfect alignment of bearings and uniformity of parts in the complete idlers.

Heart of the efficient belt conveyor of today is the idler. To this all-important element Link-Belt has given continuous attention as a result of which present Link-Belt designs offer the most in dependability and low service cost.

Get information now on better belt conveyor equipment—whether for modernization or new installation needs.

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A TYPE FOR EVERY SERVICE

BELT CONVEYOR EQUIPMENT

IDLERS • TRIPPERS • BELTS • PULLEYS • BEARINGS • TAKE-UPS • DRIVES

NEXT MONTH'S ISSUE

Changes in the course of business created by the war in Europe and rearmament in this country also are reflected in the rock products industries. New factories are being erected, military roads, airports, and fortifications will take large tonnages of aggregates and cement, but the enormous expansion in steel and other metallurgical and chemical industries is now making necessary the operation of limestone, feldspar, mica, and other plants on a working schedule of 24 hours a day in some cases. Coming articles will describe the operations of these plants and how they have stepped up production.

Flux Stone

Typical of the activity now evident in flux stone plants is the description of a new all-steel unit of 300 tons hourly capacity in which heavy Diesel-powered trucks are used for haulage to the crusher. Features of this plant include: a grizzley ahead of the primary crusher to by-pass small stone; 100 percent self-cleaning railroad bins with air-operated bin gates; and scales for weighing loaded trucks before dumping to check inventory and as a basis for paying royalty.

Underground Tunnels

A new sand and gravel plant has been constructed in the Middle West which incorporates some unusual equipment. A Diesel-operated locomotive, built particularly for this job, is used in switching operations, and truck handling facilities are large enough to take care of increased demands. Tunnel conveyors are used extensively in reclaiming and blending material from stock piles and bins. All usable fines are carefully recovered.

Crushing Boulders

A New England sand and gravel plant working a glacial deposit solved the problem of economically handling a comparatively large percentage of boulders by designing the plant with proper crushing equipment. No large boulders are transported by conveyors as the larger material is immediately scalped out and crushed.

New Gypsum Products

Although the gypsum industry in this country is undoubtedly better organized for mass production than in any other country in the world, Europe has made certain advances in special products which should not be ignored. The next issue will describe some of the many special gypsum products made by a prominent company in Switzerland.

Chemist Corner

"Chemical Analyses of the Sugar Extracts of Portland Cement" is the subject of an article dealing with further studies of the Merriman test by the National Bureau of Standards, showing the amounts of the several cement constituents dissolved by the sugar solution.

Concrete Products

An entirely new process of making concrete products has been developed and is now in operation at a plant in the East. The process is continuous and consists of pouring a wet mix of concrete into a row of molds. Curing is done by direct application of heat to the molds while in place and not by means of steam, the present generally accepted practice.

ROCK PRODUCTS

RECOGNIZED THE WORLD OVER AS THE LEADER IN ITS FIELD

With which has been consolidated the journals *Cement and Engineering News* (founded 1896) and *Concrete Products* (established 1918)

VOL. 43, No. 9

Contents for September, 1940

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ROCK PRODUCTS Bears the Twin Hall-Marks of Known Value.

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Authentic facts relating to editorial scope and readership analysis.

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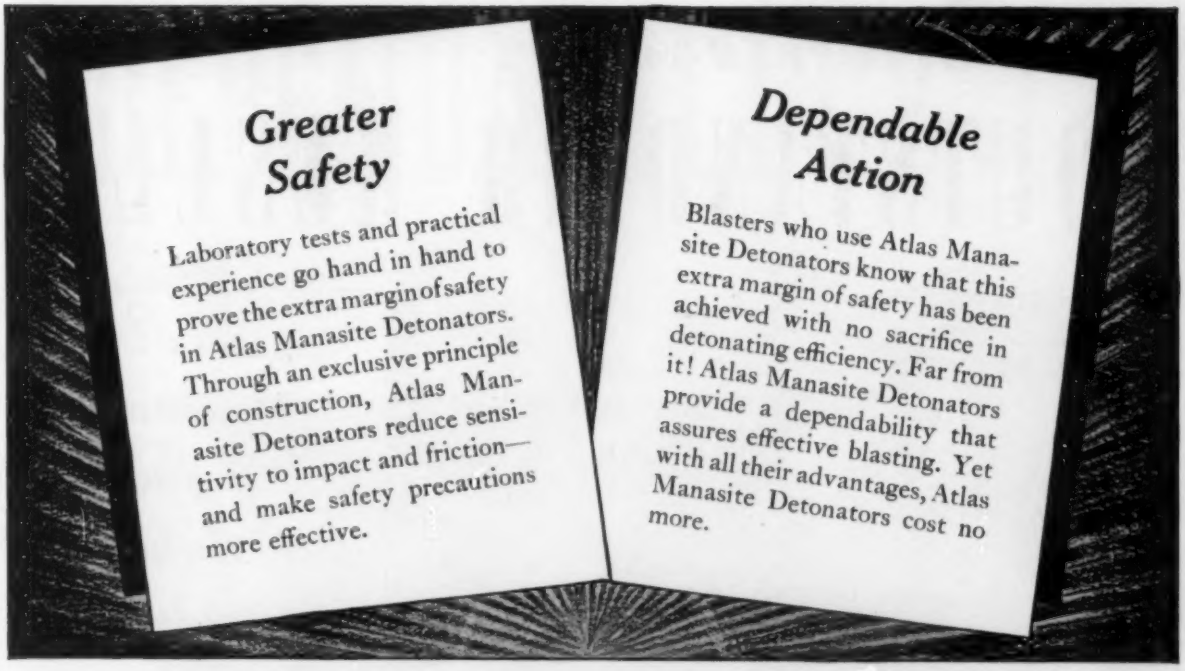

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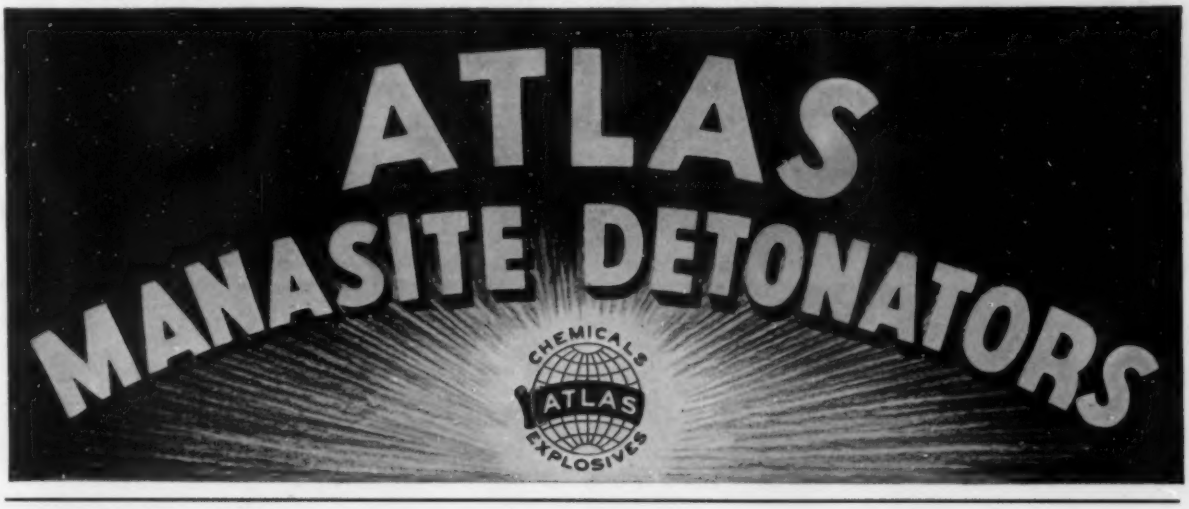
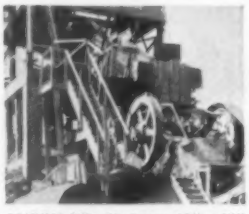


Contractors Report

OUTSTANDING RESULTS

THE POSSUM-KINGDOM DAM on the Brazos River near Mineral Wells, Texas. Construction by C. F. Lytle and Al. Johnson, and R. W. Briggs & Co. . . . lubricated by Texaco.

. . . at Possum-Kingdom Dam Project



BRIGGS' Allis-Chalmers 40" x 42" Jaw Crusher handled 325,000 yds. of aggregate in 14 months, without a bearing adjustment. *Texaco Marfak* used.

THESE TWO Sullivan Balanced Angle Air Compressors are subjected to heavy loading, yet are always up to maximum efficiency. *Texaco Algol Oil* is given full credit for its part in this performance.

SHOVELS AND TRUCKS operated by R. W. Briggs & Co. are always at peak, lubricated with *Texaco Marfak, Thuban, Crater.*

RUSHING completion of the Possum-Kingdom Dam Project, Mineral Wells, Texas, the C. F. Lytle and Al. Johnson Construction Co., and R. W. Briggs & Co. have enjoyed long, continuous service from their equipment.

Both of these contracting firms freely give credit to the lubricants used . . . TEXACO.

In 14 months, a big jaw crusher has handled 325,000 cu. yds. of concrete aggregate without need of a bearing adjustment. It is lubricated with *Texaco Marfak.*

On shovels, draglines and "Cats" they have had similar success . . . using *Texaco Ursa, Marfak, Thuban,* and *Crater.*

In 3 big air compressors operated by Lytle & Johnson Construction Co., *Texaco Algol Oil* keeps valves active and ports clean, resisting gumming and hard carbon formation. What little carbon forms is soft, fluffy, harmless.

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REG. T.M.

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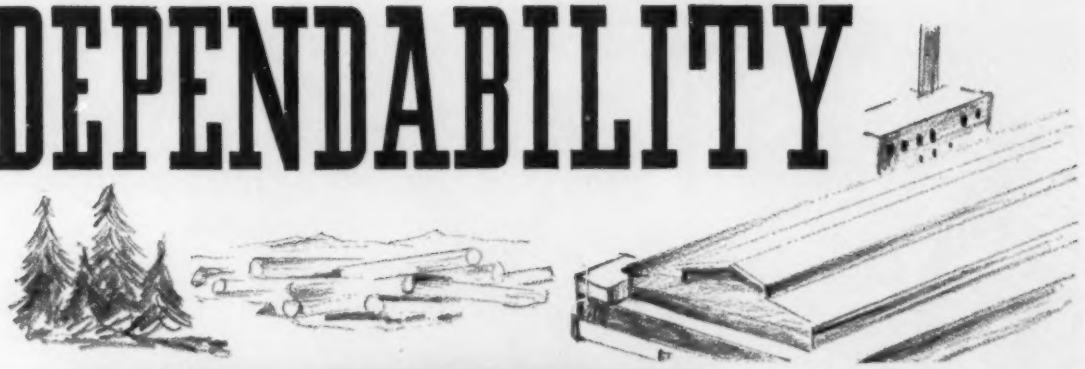
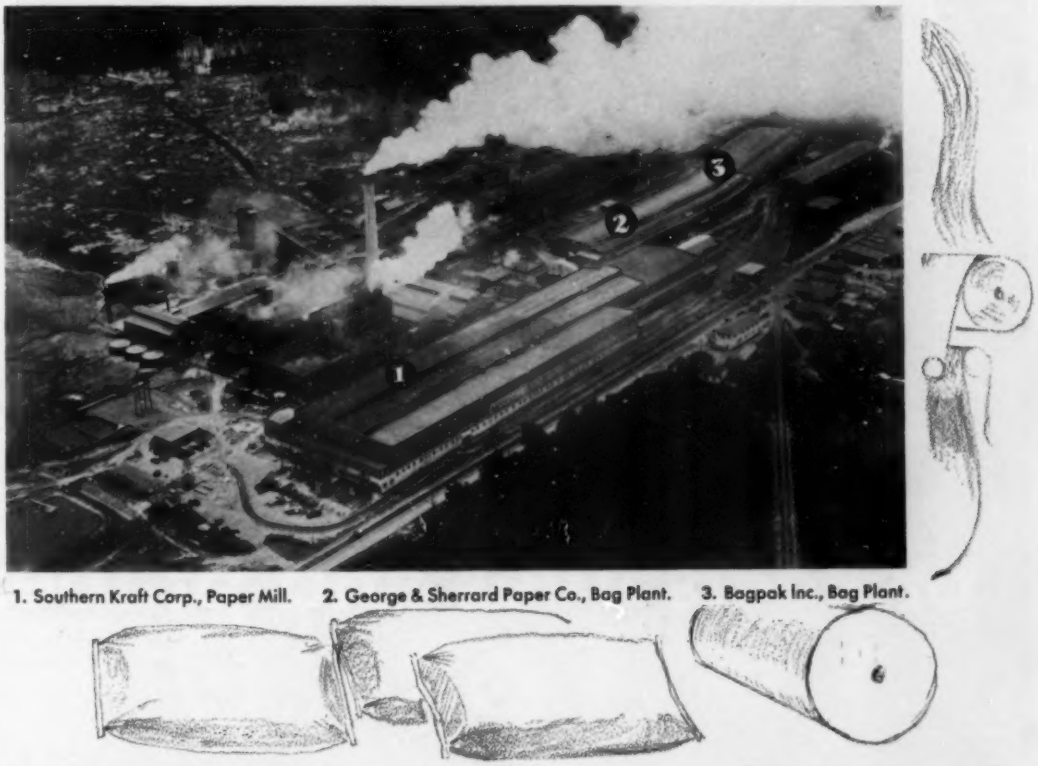
DEPENDABILITY





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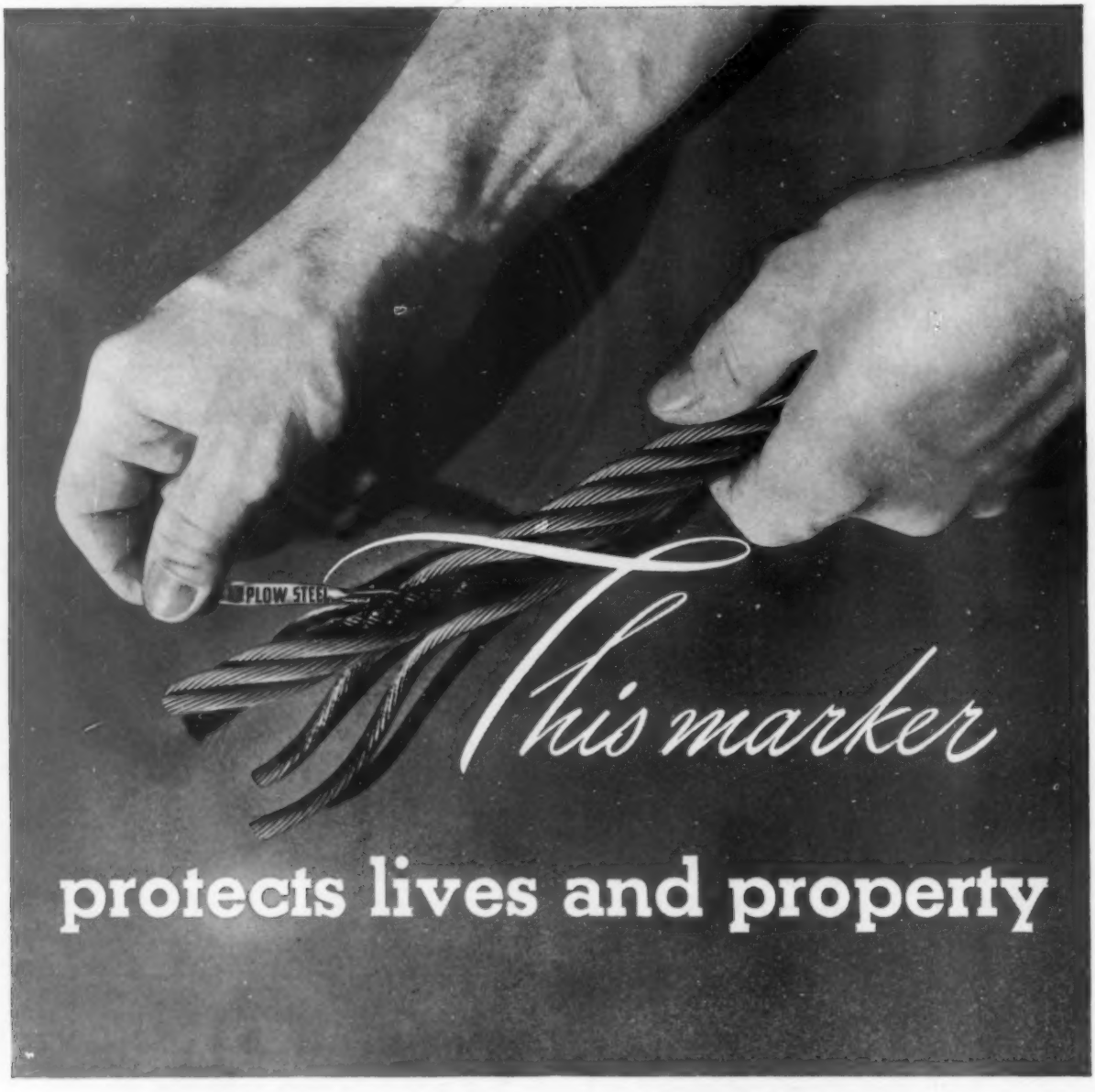

An exclusive identification tape is built into every foot of Bethlehem Wire Rope. This tape—known as Telfax—is clearly marked with the grade of steel in the rope. As a double check, each tape bears a distinctive color—purple—Purple Strand; green—Plow Steel; red—Cast Steel, and so on.

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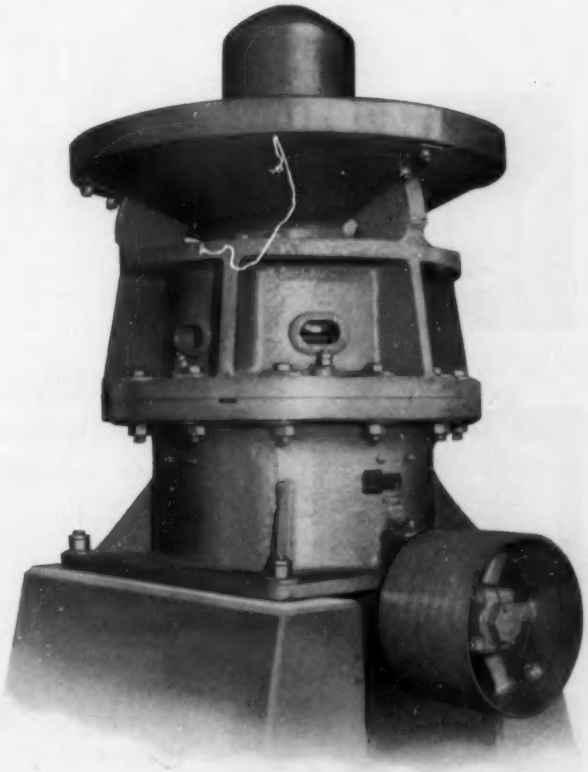
Telfax tape is laid next to the core. Regardless of whether the rope has been respooled or comes to you in cut lengths, with all markings lost, you can check it quickly and easily with the Telfax identification tape.

BETHLEHEM STEEL COMPANY

A BUILT-IN FEEDER and TWO STAGES of CRUSHING

ALL IN ONE MACHINE—

OUR Multi-Stage Fine Reduction Crusher



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The Feeder is the Upper Stage, which also accomplishes about 50% of the crushing desired. This Stage can be adjusted so as to supply the Lower Stage with a sized feed in exactly the right quantity, and ideally distributed all around the crushing chamber of the latter. The adjusting arrangement of the Upper Stage is entirely independent from that of the Lower.

The Multi-Stage Crusher is offered to operators who have a demand for large tonnages of fine product,—9/16" and smaller,—which it will deliver at considerably less unit cost than is usually experienced in service of this kind. Also, the product is cubical, with a minimum of slabby pieces and a very much less-than-usual percentage of undesirable "fines."

The crusher is of simple design, fool-proof and trouble-proof. The frame is cast steel and both crushing chambers are fitted with manganese steel Traylor Original, Patented, Non-Choking Bell Heads and Curved Concaves. Other patented features are a positive and automatic force-feed Lubrication System and complete Dust Protection. A spring suspension of simple design guards against damage from tramp iron.

Our Bulletin 113 contains many interesting additional details, and our representative can tell about others of a nature not usually published. Get both stories—Write us today.

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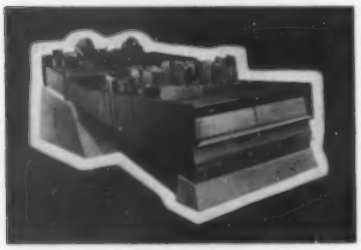
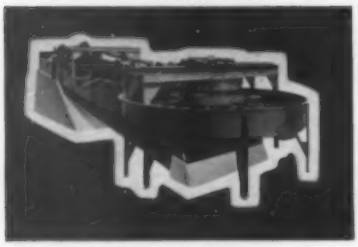
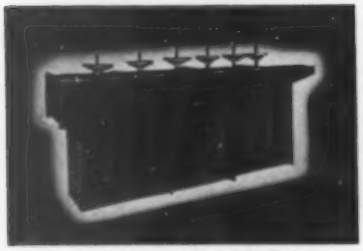
Dorr Hydroseparators—for removing silt, clay and the bulk of the wash water from screen undersize.



The Dorr Classifier



The Dorr Bowl Classifier



The Fahrenwald Sizer (Mfg. by Dorr) for making up to six closely sized fractions from a heterogeneous feed.

The Dorr System is a flexible system of interconnected units for processing "run of pit" sand to meet close specifications with respect both to size and to their distribution.

Each piece of equipment has been developed to perform a single specific operation. They may be arranged in various combinations and sequences to recut the most heterogeneous pit deposits to form top specification, concrete, glass and special purpose sands.

Dorr Systems as small as 50 tons an hour are applying the same Dorr practices demonstrated so successfully on the huge Boulder, Grand Coulee and Shasta Dam projects. Same machines and methods—only scaled down to meet the smaller tonnage requirements of commercial sand companies.

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THERE's a brutish beauty about a unit like the Ford in this picture — a feeling of massiveness and strength held within clean lines. It takes your eye.

But it gives you a powerful respect for its downright ruggedness too. It tells you again what you already know — that you can count on a Ford to *stand up* on daily jobs that might take the heart right out of a unit less solidly built, less skilfully and honestly engineered.

And there's that important word, *economy*. Ford Trucks can save money for you in more ways than one. They're easy on oil and gas. They don't cost much to begin with and they bring a high consideration from any Ford dealer when it's time to trade them in. They last a long while.

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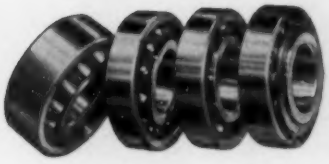

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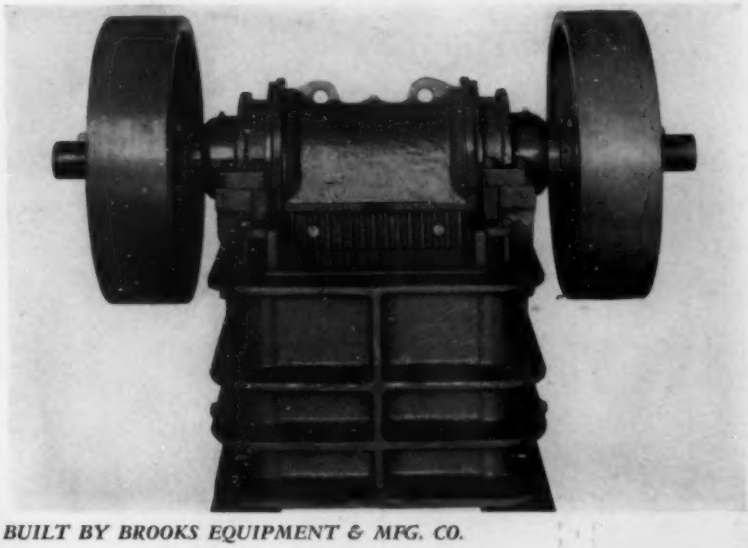
but not BEARINGS

Not only jaw crushers, but ALL Brooks products are SKF-equipped.



BUILT BY BROOKS EQUIPMENT & MFG. CO.

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SKF Mountings are practical. Self-aligning bearings compensate for shaft deflections, distortions or weave without losing their high capacity. They need no adjustment for wear . . . have everything a bearing on a crusher needs for years of hard service.

So we're passing on this thought to you: the same benefits derived from the use of SKF Bearings on Day crushers can be *yours* merely by selecting SKF Bearings. 4637

SKF

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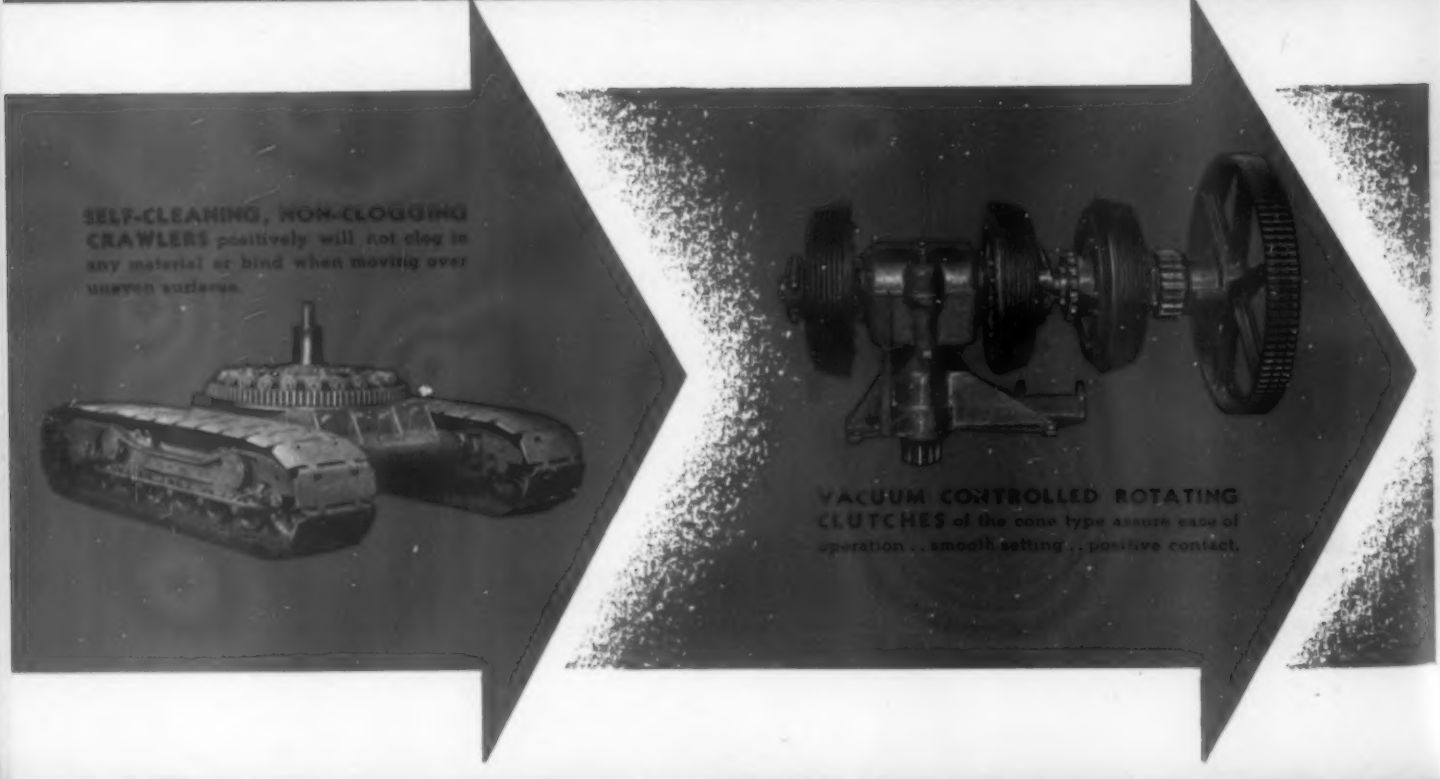

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SENT DAY EDS . . .

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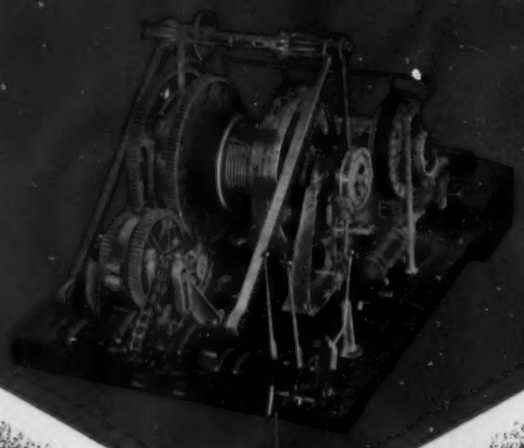

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HORIZONTAL PROPELLING SHAFT includes the multiple jaw clutches for connecting the power to the crawler belts and the outside band check brake that locks the machine against slipping thrust.

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99.9% MINUS 325-Mesh

Speed of Whizzer controls Fineness of Product

With higher specifications being demanded on many powdered materials, the Raymond double-whizzer type Roller Mill becomes more important than ever in controlling the finished product and reducing production costs.

The fineness can be varied while the mill is running simply by a turn of the whizzer speed control dial. This makes it possible to produce a wide range of different grades without changing the set-up or interrupting production.

The whizzer separator permits free passage of the material, resulting in greatly increased capacities with record low tonnage costs. You can obtain both economy and quality with the Raymond Roller Mill in grinding limestone, gypsum, clay, chalk whiting, kaolin and many other nonmetallic minerals. Write for detailed information.

May be equipped with drying system for removing moisture while pulverizing.

SINCE 1887

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In This Issue

Another Rock Products Triumph

The PENNSYLVANIA TURNPIKE article describes the production of crushed stone, sand and portland cement for America's outstanding piece of highway construction. This is invaluable to plant operators, highway builders and machinery manufacturers because the specifications for the production of all material represents the latest in standards and likely will be forerunners for specifications that will govern future work of this calibre.

Many magazines, business papers and newspapers have published articles about the Pennsylvania Turnpike but this is the first time any information of value to the rock products industry has been offered.

The first part of the article describes the volume required, sources of supply and the preliminary work done to get many of the plants ready to produce stone in the volume required.

The second part covers the specifications, pointing out how they differ from other specifications, and places emphasis on types of machinery and equipment installed to meet the various provisions of the specifications.

The third part is a detailed discussion of a number of crushed stone plants that made certain equipment changes that were necessary, first of all to get out high tonnages, and second, to meet these specifications.

The Significance of The Pennsylvania Turnpike Article to the Rock Products Industry

The Pennsylvania State Legislature is taking steps to extend this highway from Harrisburg to Philadelphia, and there has been considerable discussion which seems to indicate that other roads of this type will follow in other parts of the country.

For that reason these specifications and methods devised to meet them should be studied carefully by all producers of aggregates and machinery men who will have to supply equipment to produce satisfactory stone for such future work.

EASY TO CHANGE AND HOLD KILN SPEED

When You Use G-E Direct-current Drive with Field Control

GENERAL ELECTRIC

Offers

NOT ONE—NOT TWO—

BUT SIX—

Dependable Kiln Drives That Meet All Modernization Requirements

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2. Direct-current with field control
3. Adjustable-speed, brush-shifting a-c
4. Wound-rotor (slip-ring)
5. Squirrel-cage induction
6. Gear-motor (may be applicable in certain sizes to any type of motor)

D-C DRIVE with field control gives you close speed adjustment over a wide range. By the use of Selsyns, you can synchronize kiln and feeder for any rate of production desired. And, by the use of photoelectric pyrometer control, you have a flexible and accurately adjustable system for controlling kiln temperature. Here's a perfect combination for producing the special cements that are being increasingly specified by consulting engineers.

THE MOTOR for this application is the straight shunt-wound type. It not only has ample starting torque but also close speed regulation. You can get the speed you want, and hold it. Changes in load, such as might be caused by a warped kiln, have very little effect on speed. The result: you eliminate one of the variables in kiln temperature control and have added assurance that your product will be uniformly high in quality.

MOST CEMENT PLANTS have use for direct current anyway—for feeder motors, synchronous-motor excitation, cranes, and in the machine shop—so it's often the logical thing to plan on making the kiln drive d-c, too. Shunt-field control enables you to take the power from any d-c bus, and it seems to fit in with the economy of one-kiln plants particularly. Of course, there are usually a number of factors involved in selecting the kiln drive for any plant. Therefore, it would be advisable to talk over your requirements with our cement-mill specialists. They will be glad to work with you. General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

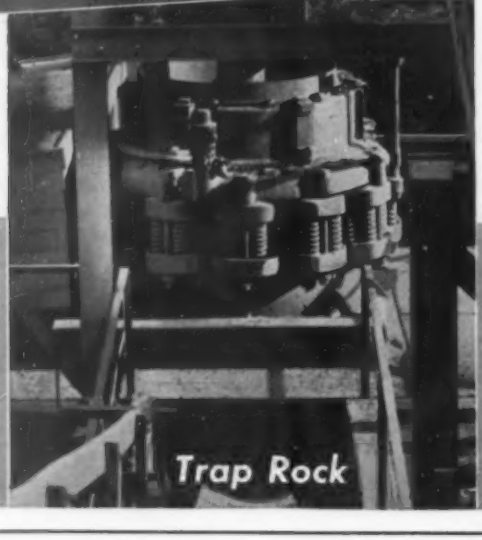
652-3

SYMONS SHORT HEAD CONE
for making those minus ½ inch sizes

• • Still the world's outstanding crusher for fine reduction of all materials • •


Limestone


Quartzite


Trap Rock

Making minus half inch material is a field for which the Symons Short Head Cone is primarily adapted. That so many of the larger producers of stone, gravel and slag should standardize on this crusher is evidence of its superiority for this class of work. Producers engaged in making those finer sized materials for black top and other types of stabilized roads will find this crusher exactly suited to their needs. There is no guesswork in the production of these fine materials with Short Heads. Obtain just the sizes you require in quantities that meet your demands and at a crushing cost which will assure of greater profit by doing your fine reduction crushing with a Symons Short Head Cone.

Write us for further particulars on this Short Head Crusher, the solution to your fine crushing problems.

NORDBERG
MFG. COMPANY
MILWAUKEE, WIS.

NEW YORK
60 East 42nd Street

LOS ANGELES
Subway Term. Bldg.

TORONTO
Concourse Bldg.

LONDON
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OHIO GRAVEL Co.

CINCINNATI, OHIO

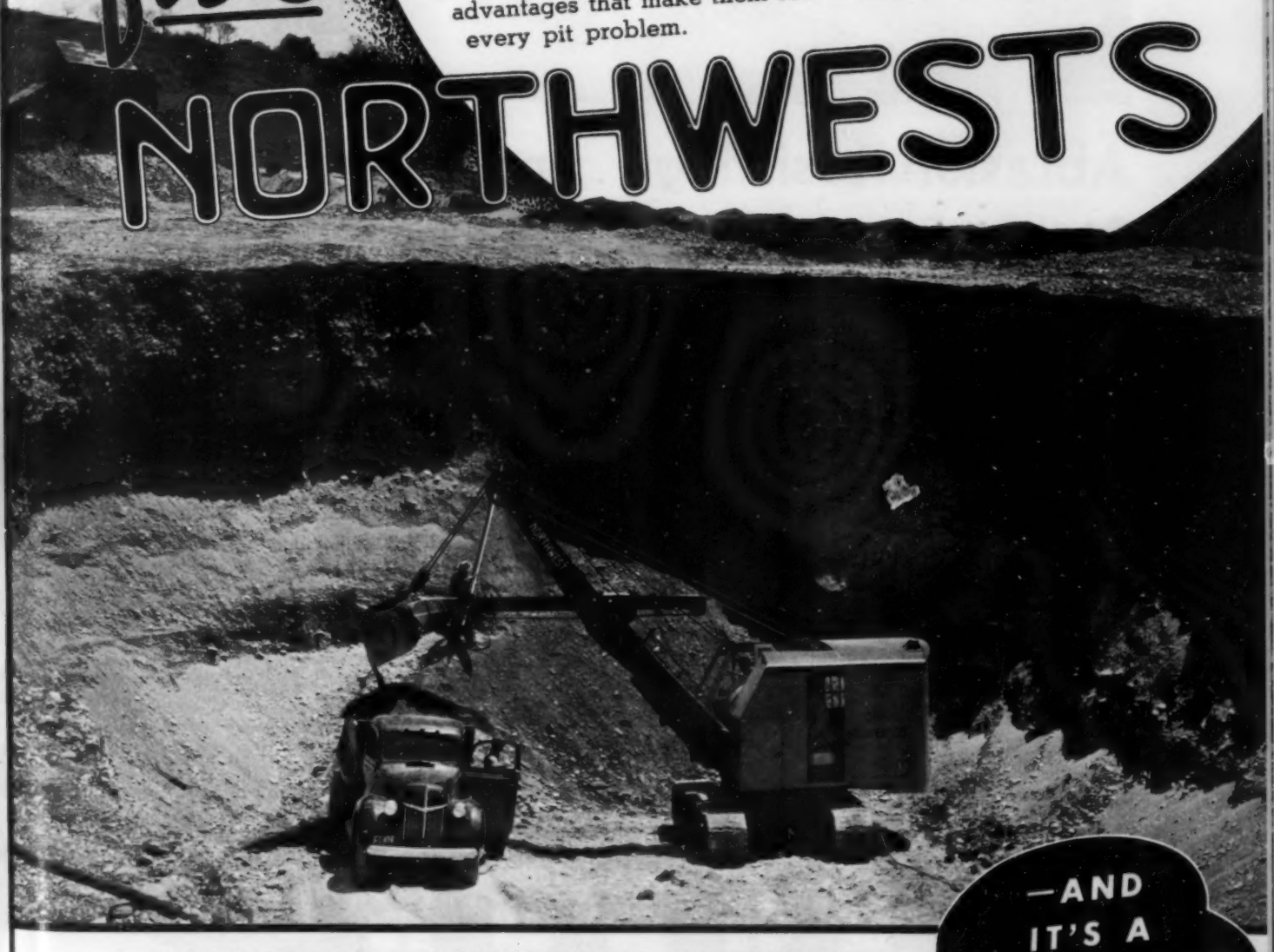
makes it five

ASK yourself—would you buy another machine of the same make if your first had not been eminently satisfactory? No, you wouldn't! Neither would the hundreds of Northwest owners who have been repeat order buyers.

Northwest repeat orders form an incontrovertible story of satisfactory service—a testimonial to Northwest performance that can't be overlooked.

Five Northwests for the Ohio Gravel Co. in less than ten years is the best possible assurance that Northwests in *your* pit are going to turn out more for less. Northwest shovels and cranes bring you advantages that make them *real* rock shovels! There is a size for every pit problem.

NORTHWESTS



—AND IT'S A REAL ROCK SHOVEL!

NORTHWEST ENGINEERING COMPANY
1820 Steger Building • 28 East Jackson Boulevard
CHICAGO, ILLINOIS

Shovels • Cranes • Draglines • Pullshovels

Abrasion Resisting . . and Other Special Steels for the Rock Products Industry

Ryerson Abrasion Resisting Steel Plates and Sheets are *just one* of the many Ryerson Certified Steels designed to give longer life at lower cost in dozens of rock industry applications where wear and replacement expense are important factors. Screens, chutes, hoppers, buckets, paddles, and liners, of this tough, hard, wear-resisting steel last many times longer than when made of ordinary steel, yet are moderate in price. They even compare favorably in many cases with high-priced alloy castings, and the saving in cost is considerable. Abrasion-resisting plates and sheets are furnished plain or bent, perforated, punched or formed, to exact specifications.

Similarly, Ry-Ax Alloy Steel is widely employed to reduce overhead through longer wear and greater freedom from expensive break-downs in periods of intensive production.

Ryerson can supply quickly all of your steel requirements. Ten conveniently located plants, carrying more than 10,000 kinds, shapes, and sizes of Ryerson Certified Steels in stock are ready to make immediate shipment, and assist you in the prompt solution of any operating problem involving steel. Write, wire or 'phone the nearest Ryerson plant for this special service. If you haven't a copy of the latest Ryerson Stock List, let us send you one!

OTHER RYERSON CERTIFIED STEELS IN STOCK

Ryerson stocks include practically everything in steel and allied lines. The following is a partial list of products carried in stock:

- **Beams and Heavy Structurals**
- **Channels, Angles, Tees and Zees**
- **Rails, Splices, Spikes, Bolts, Etc.**
- **Plates—Sheets**
- **Strip Steel, Flat Wire, Etc.**
- **Stainless Steel**
- **Hot Rolled Bars—Hoops and Bands**
- **Cold Finished Shafting**
- **Alloy Steels—Tool Steels**
- **Heat Treated Alloy Steel Bars**
- **Mechanical Tubing**
- **Boiler Tubes and Fittings**
- **Welding Rod, Wire**
- **Rivets, Bolts, Nuts, Washers, Etc.**
- **Concrete Reinforcing Bars**
- **Babbitt Metal and Solder**

JOSEPH T. RYERSON & SON, INC., Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City

RYERSON

RYERSON CERTIFIED STEELS

PRECEDENT FOR EXPEDITIOUS CONSTRUCTION

We anticipate that this will be a particularly helpful issue to producers of concrete aggregates because a considerable part is devoted to a report by one of the editors on the Pennsylvania Turnpike job. The editor went on his mission with only one purpose in mind: to study, investigate and report to the industry how the aggregate producers met sudden, large and severe requirements for materials to be used in a masterpiece of highway construction.

This job has special significance at this time for a number of reasons. It was done as expeditiously as any similar job was ever done. Highway and other construction in our national defense program will have to be expeditiously done, if it is to be effective. It is the first toll road project of its kind, and if it proves likely to be self-liquidating, assurance has been given that other superhighways will be similarly financed. Every effort was made to get the best construction materials available, the best workmanship, the best engineering talent. Hence specifications and methods of practice will have an important influence on other public works.

The manner in which the job was handled proves that public work can be efficiently and expeditiously done to the satisfaction of all concerned. The prime reason back of this was almost perfect coöperation and coördination of the work of the engineers, contractors and material men; and a lack of motive or desire for any one of these necessary elements "to stick" the other. Contracts were not let with the idea that the Turnpike Commission could save by eliminating profits.

Our report deals only with the supplying of cement, sand, and coarse aggregates. It gives first a general picture of the conditions, the country, the sources of supply, details as to contracts, etc. We then discuss specifications; what they were and why they were; and the changes in production methods they made necessary or desirable. In conclusion, specific changes made in various plants to step up production and meet specifications are described in detail. This treatment is unusual, if not unique in publications serving this field. Too frequently plant descriptions are published which are little more than rather meaningless pictures and mere lists of equipment. We are seldom guilty of such "descriptiǒns" because in every article we try to give something of the reasons back of various practices or choices of equipment.

The purpose, of course, of going into such detail in plant equipment is to aid producers in selecting equipment for their own operations. It always seemed to us that this purpose was largely defeated unless the readers were informed on reasons for such installations. So our articles are different from some that are published; and in this issue the Turnpike article is altogether different in that it is a thorough report, not on how a single producer spent money for new equipment, but how a group in the industry equipped their plants to the best possible advantage, with the benefit of mutual and expert advice.

In the first place the producers had the advantage of the coöperation and advice of the Turnpike Commission's engineers on sources of supply and methods of quarry development. It is significant that about 90 percent of the aggregates came from existing commercial producers. Yet no awards were made to producers in excess of their ability to produce. Their ability to produce was expanded in economical ways.

This was done by awarding material contracts well in advance of the opening of the construction season, which allowed contractors to perfect details of deliveries, and permitted producers to prepare stockpiles. In this way capacities of plants were stepped up without excessive investment in new equipment. Also operations designed for 8-hour days were redesigned for 16-, 20- and 24-hour daily production. For example, a plant originally built for 75 tons per hour capacity, by adding certain new equipment, working 3 shifts, and stockpiling, was stepped up to 100 tons per hour, and was able to make daily shipments of from 5000 to 6000 tons to five and sometimes seven contractors.

Coöperation among the producers themselves made it possible to divide or share Turnpike requirements; or where a producer was devoting all his facilities to production for the Turnpike, for his competitors to take care of his regular commercial business. As a result of this general good feeling and the ability to view the problems of the industry as a whole, rather than selfishly, excessive expansion of production facilities, which would have proved a burden when the Turnpike job was done, was avoided.

Now that the job is done, the producers are equipped to make better products more efficiently, have made a fair profit, and have invested a good part of it in new and improved equipment and machinery, which helped other "capital goods" manufacturers to pay wages and earn profits. Altogether, it looks as if the Pennsylvania Turnpike had already served a very useful end; and we hope it will be so financially successful, or self-liquidating, that similar jobs can be done.

Nathan C. Rockwood

NEWS AND COMMENT

Refinancing Still Easy for Strong Companies

THE MONTH'S NEWS includes plans for refinancing the Pennsylvania-Dixie Cement Corporation. Stockholders have approved a plan to retire 6 percent first mortgage bonds due in 1941 and create new first mortgage bonds at 4½ percent. All $6,059,000 of the old bonds will be retired and $4,250,000 new bonds issued. All the new ones will be taken by an insurance company. A five-year bank loan for $2,250,000 at 3¾ percent will take care of the rest of the refinancing.

Penn.-Dixie has made quite a remarkable record through the depression. In 1932, as we recall, its bonded debt was about $10,000,000 and the price of these bonds on the New York Stock Exchange went down to almost 25 cents on the dollar. Yet the company never missed an interest payment.

The Pennsylvania Glass Sand Corp. is retiring 4½ percent first mortgage bonds at 105 and reissuing 3½ percent first mortgage bonds.

Few mortgage bonds of large strong companies any longer are offered for public sale. Insurance companies and banks take whole issues. Possibly the same opportunity to refinance at lower rates will eventually come to *small* strong companies. They should offer no greater risks.

Rock Wool Industry Continues Expansion

BECAUSE of its light weight, which prevents long freight hauls, the rock wool industry is fast becoming a local proposition. It is not difficult to manufacture, requiring essentially the mere melting or slagging of a limestone with argillaceous minerals, present either as impurities in the limestone or added in an artificial mixture.

We note that our old friend the Waukesha Lime and Stone Co., Waukesha, Wis., has recently completed a rock wool plant to round out its line of limestone products. Another new one in the month's news is the Building Guard Rock Wool Co., Memphis, Tenn. One plant, we presume, will furnish insulation chiefly to keep out the Wisconsin cold winters and the other the Tennessee hot summers.

The chief drawback to the promiscuous production of rock wool, we are told, is the distribution difficulty.

Introduction

IT IS proposed on this page (or pages) to experiment with a news digest and its interpretation insofar as such news affects this rock products industry; to include also relevant comment by the editor and from readers. We are starting it in the midst of the vacation period, so we may be able to improve with more time for preparation. If you like it, or if you don't like it, we want to know.

—The Editors

It has to be sold largely through building supply and lumber dealers; and that requires a sales organization which the average small operator cannot afford. The alternative is to sell the entire plant output to a large manufacturer who can take care of the distribution—a one customer setup no producer likes.

Northwest Chemical Industry Starting

CHEAP ELECTRICITY will eventually draw many new industries to the Northwest. An aluminum plant is already under construction. More recently it was announced that Pacific Carbon and Alloys Co. will build a plant in Portland, Ore., to make calcium carbide. Both industries require large quantities of limestone.

Washington Brick and Lime Co., Spokane, Wash., is reported to have made a contract to furnish limestone for the carbide plant from a new quarry to be opened at Grants Pass, Ore. The stone is said to be one of the purest in the United States. These limestone deposits have long been known, but new industries open new possibilities.

The general public usually connects the rock products industry exclusively with the construction industry, but limestone is essential to the manufacture of many basic chemicals and to most metallurgical operations.

Can't Use Bureau of Standards Tests in Advertising

THE FEDERAL TRADE COMMISSION has issued a cease and desist order against the Hy-Test Cement Co., Philadelphia to prevent it from using the results of tests on masonry mortars made at the National Bureau of Standards in its advertising and promotional literature. The commission maintains that the company in making use of such data "violated the established understanding between the Bureau and participants in the tests that such tests were of a confidential nature, were for the purpose of improving the mortars tested, and the results were not to be used for sales promotion."

The commission's order prohibits the respondent from divulging or assisting the purchasing public in determining the identity of the manufacturer or the brand name of any cement which was tested by the Bureau of Standards of the United States Department of Commerce, the results of which tests were published with cements tested listed under code or symbol numbers by the Bureau.

The order also prohibits use by the company for sales promotional purposes of any report by a United States agency, where use of such report is violative of any regulation issued by the agency, or where such use implies that the agency has approved or recommended the use of respondent's products.

Gypsum Anti-Trust Suit

THE SIX large gypsum products manufacturers are being sued by the U. S. Department of Justice, both in civil and criminal suits, under the anti-trust laws. It is alleged that patent licenses were used to fix and maintain the price of wallboard. Commenting on these suits Melvin H. Baker, president of National Gypsum Co., said recently:

"Patent licenses of the kind questioned have been in existence for the past one hundred years, and the legality of contracts similar to those in the gypsum industry was upheld

in a decision rendered by Chief Justice Taft for the Supreme Court in the General Electric case. The specific patent contracts now in effect were approved in 1929 by three United States district courts, including the District Court at Buffalo, New York.

"This may indicate that management has used every precaution for proper interpretation of the law.

"The Department of Justice apparently has developed a new interpretation of the anti-trust laws and expects to give the Supreme Court an opportunity to reverse the decision handed down by Chief Justice Taft. If it does we shall, of course, abide by the decision. In making decisions for our business we can only be guided by what the Court has said the law was, and not by a guess for how these interpretations might later be changed by some particular administration.

"The use of gypsum is essential to modern building methods. Because of the important part the building industry must play in our national defense program, this means of harassing a great industry is indeed unfortunate at this time."

More and More Governors

ALTHOUGH the number of employes in every branch of business and industry has declined since 1929 from 0.4 percent in finance, service and miscellaneous business to 40.5 percent in construction, the number of employes of federal, state and local governments has *increased* by 830,000, or 24.8 percent. This figure does not include payrollers in W.P.A., N.Y.A. or C.C.C. That gives you some idea of the growing menace of bureaucracy. The figures are those of the Bureau of Labor Statistics, U. S. Department of Labor. And these figures do not include additions to Washington personnel since June 30, 1940, which must be around 100,000.

Preceding France's Downfall

TWO ITEMS on this page are interesting in connection with the following lament of former Premier Daladier, of France, made in November, 1938: "that section of France's population that creates wealth and works for the future is constantly decreasing while that living off the state directly or indirectly is increasing . . . the number of Frenchmen taking the risks of private enterprise is on the decrease . . . let each one work more and the state spend less . . . it is elementary, but imperative."

War Business

WE ARE NOT AT WAR yet, but probably are rapidly approaching a war status. The questions foremost in everyone's mind are: How will this affect me, my business, my job.

We are going to have prosperity of a kind—prosperity meaning a lot of people working, earning money and spending money. That prosperity will help all industry including this one.

A lot of people have been anxiously looking for some new industry to revive prosperity—as in the past like automobiles, radios, etc. The outstanding point about the present business situation is that we are now embarking on such a new industry—and a vast one. It is the manufacture of instruments for destruction—ships, guns, tanks, munitions of war.

Rock products manufacturers and producers are in the picture as suppliers of construction materials, basic ingredients for chemical and metallurgical operations and agricultural necessities. The effect on the demand for construction materials is hardly evident as yet, but is sure soon to bring new life to producers with access to industrial centers.

•

How long will this prosperity last? We are starting from scratch. It will take at least two to four years to spend the funds already appropriated. It is a definite answer to this question that is delaying much industrial plant building and expansion. How are they to be paid for?

Government cannot blame managers of industry for hesitating to spend their stockholders' money with experience so recent as the 1914-1918 world war and aftermath.

•

What will be the effect on roadbuilding? Probably none for the immediate present. Roads have a decided military value. The War Department has studied an 80,000-mile system of strategic highways. Most of these probably are on or near our coast lines.

However, army engineers are divided in opinion as to how to defend our coasts against landing forces. Some believe in fixed batteries of the heaviest coast artillery; some in mobile units of big artillery which can be rushed to any required point, provided adequate highways or railways are available.

Either method of coast defense will call for much heavy construction in concrete; the second method, of course, which seems the more logical to a layman, will require enormous amounts of special highway or railway track construction.

For example, in the 80,000-mile War Department system of strategic highways are 2000 bridges which would have to be strengthened or replaced.

What effect will war prosperity have on the railways, which used to be the rock products industry's second best customer? The answer to that is already obvious in the increasing orders for new rolling stock. Railway maintenance-of-way men say that well-compacted old roadbeds do not require as much new ballast periodically as formerly was considered absolutely essential. However, anyone who has traveled much by rail in recent years knows railway roadbeds need ballasting. It will come with increased traffic.

Labor Union Cooperation

WE SAID in our August issue editorial that several national labor union leaders had promised the President their coöperation for national defense. At Niagara Falls, N. Y., August 19, at a meeting of the New York State Federation of Labor, William Green, president of the American Federation of Labor, was more specific. He generously agreed, for the time being, to abandon the fight for 30-hour weeks, although he will insist there be no wage reductions and that overtime rates be paid on everything over 8 hours per day.

Dolomite Refractories

A BYPRODUCT of the greatly expanded steel production, in addition to increased demand for limestone flux, is the demand for dolomitic refractory products. Basic Dolomite, Inc., producers of refractories for use in open hearth and electric steel furnaces, is nearing completion of a $400,000 plant expansion program designed to increase capacity for supplying various refractory materials needed by the steel industry in connection with stepped-up activity for the national defense program.

Expected to be completed by the middle of August, the expansion includes installation of two new rotary kilns as part of a $275,000 addition to the plant near Tiffin, Ohio, and a recently completed $125,000 plant for the manufacture of newly developed refractory products.

Blend Natural with Pulverized Sand

Looking at ball mill from discharge end, showing oil-fired dryer on right. Loop classifier is overhead

CONSIDERABLE INGENUITY has been required of producers in meeting Federal specifications for concrete sand which demand more of the fine fractions around 50-mesh and definite amounts of minus 100-mesh material. Deposits vary in different sections of the country. Some companies, producing aggregates where plenty of fines exist, have had to install classification systems with unusually large settling areas to keep the fines from being washed away. Others have built intricate plants to split the sand into several fractions and recombine in definite proportions. This method also depends upon a sufficient supply of fines to make their recovery practicable on a commercial scale.

In other localities, where fines are scarce or almost non-existent, producers have had to blend fractions of fine sand from an outside source with their regular concrete sand or in some instances have added fines produced by crushing.

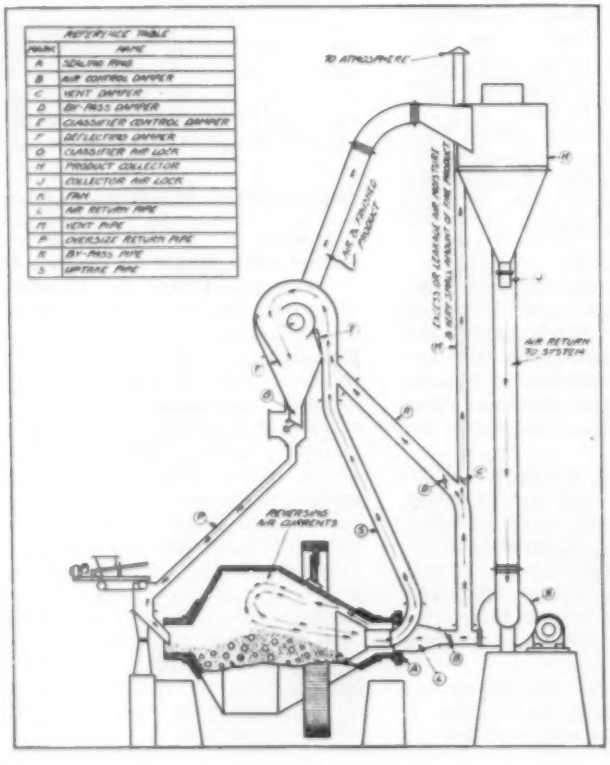
Several sizable Federal contracts for aggregates have been let recently in Western Pennsylvania for the construction of flood-prevention dams and channel improvements. Iron City Sand and Gravel Co., Pittsburgh, Penn., has U. S. War Department contracts to produce and deliver about 220,000 tons of aggregates, including 70,000 tons of sand, for the construction of the Loyalhannah dam on Loyalhannah Creek which feeds into the Allegheny River near Stroudsburg, Penn., and approximately 15,000 tons of sand for the channel improvement of the Conemaugh River at Johnstown, Penn.

Grind Concrete Sand

Sand dredged from the Ohio River bed by this company was lacking in minus 100-mesh sand and weak in minus 50-mesh. To meet requirements for this contract, and others, Iron City Sand and Gravel Co. has placed into operation a new plant which is equipped to grind normal concrete sand into fines and blend this fine material in controlled amounts by weight back into the other material. Blending is done as cars are loaded for shipment to the construction site. Requirements are for about seven 60-ton cars daily to be spaced over a two-year period.

The blending plant is located at the company's retail yard on the Allegheny River, where bargeloads of Ohio River aggregates are handled for distribution. Sand specification requirements call for 95-100 percent by weight to pass a No. 4 sieve, 45-80 percent to pass a No. 16, 15-30 percent to pass a No. 50 and 3.5 to 8 percent to go through a 100-mesh sieve.

Ordinary concrete sand produced to meet other specifications is satisfactory in the upper brackets but contains only a fraction over one percent minus 100-mesh. It averages only 10 percent through No. 50 and runs from 69 to 73 percent in the fraction through 16-mesh which tends to the high side. The problem is to produce more minus 100-mesh and to build the minus 50-mesh percentage while keeping down the fraction through 16-mesh.



Arrangement of mill showing flow of material

Pulverize in Ball Mill and Blend Sand in Cars

In order to produce these requirements, part of the product described is put through a plant, designed and built by the Hardinge Co., Inc., York, Penn., which pulverizes it into fines through a ball mill and re-blends while loading into cars.

Equipment comprises a 4- x 10-ft. air heater fired by a York oil-burner, a 6-ft. by 36-in. Hardinge ball mill and Hardinge table feeder, a Hardinge loop air classifier, Hardinge

Build special plant with ball mill, loop classifier, table feeder and constant weight feeders to produce fines from coarse sand and blend into a finished product

View of entire sand blending plant, showing ducts conveying fine product into bin. Loading of blended sand is over the belt, on the right, into cars and also to barges on the river

constant weight feeders for blending when loading cars, a 400-ton, two-compartment Blaw-Knox steel bin, a belt conveyor to the tipple and fans to transport material through mill and classifier circuit and withdraw products of combustion from oil heater and exhaust from the system's moisture-laden air.

Dredged sand is towed to this plant in barges holding from 400 to 700 tons each, and placed by gantry crane into one of the 200-ton bin compartments. This compartment serves to pay out the bulk of the material going into the finished sand and also to feed out sand by gravity to the table feeder feeding the ball mill. The grinding circuit is on the principle of an air swept mill, using air heated to 950 deg. F. It is necessary that the air stream be heated to that figure or more to keep the feed of moist sand continuously flowing through the feeder into the mill, and it is also necessary that the circuit be leak-tight for proper operation of the air classifier.

After passing through the heater, the heated air is introduced into the discharge-end trunnion of the mill where the air currents reverse into a duct leading to an overhead loop classifier. Heated air also is put through the feeder spout. The fines are separated out by the classifier, and with heated air enter a 6-ft. cyclone collector which is over the second compartment of the 400-ton bin. Here the fines are dropped into the bin and the air is returned for re-use to a No. 17 Clarage fan connected into the circuit.

Oversize sand is rejected by the loop classifier and returns by gravity through a spout into the mill feed spout. Between the No. 17 fan, which is driven by a 30-hp. motor, and the mill is a No. 7 Clarage vent booster fan driven by a 5-hp. motor. Its purpose is to exhaust excess air and moisture to the atmosphere. Sand fed into the mill runs from 4 to 10 percent free moisture, which means the drawing off of about 250 lb. of vaporized moisture per hour. Dampers are provided in the circuit, between the furnace and the mill and at other locations such as at the feeder, to control the volume of air. All the ducts in the system are covered with asbestos insulation to eliminate condensation and to conserve heat in the circuit. The temperature is controlled by a thermostat in the vent pipe from the system.

The ball mill, which has water-cooled bearings, is driven by a 75-hp. motor through V-belt. It has a W/8-type Hardinge metal liner and carries 5000 lb. of 1¼-in. forged steel balls and 5000 lb. of 2-in. forged steel balls. With an average output of 3 tons of ground product per hour, of about 85 percent siliceous material, the ball wear is about ⅜ lb. per ton of finished product. Additional balls of the designated size are added at regular intervals.

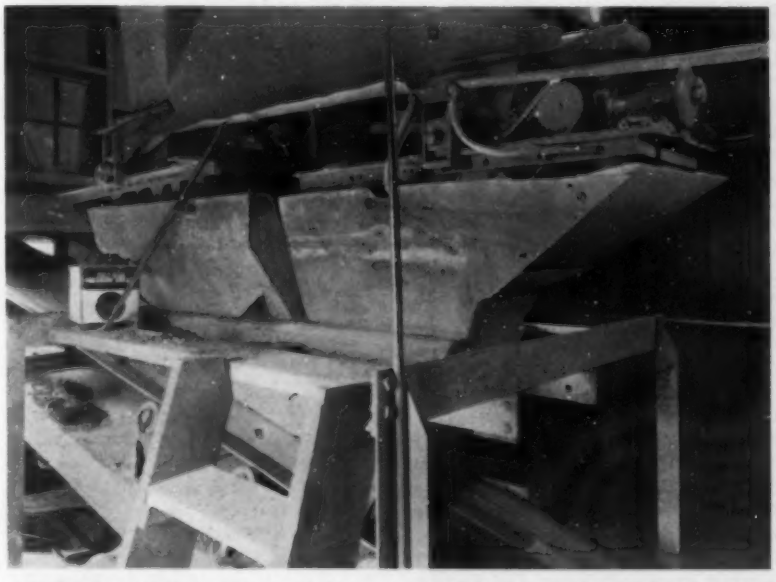
"Electric Ear" Controls Feed

A Hardinge "electric ear," actuated by the degree of loudness in the mill as it grinds, automatically stops and starts the table feeder to maintain the optimum feed into the mill.

Output averages 3 tons per hour of a product averaging 100 percent minus 16-mesh, 92 percent minus 50-mesh, 70 percent minus 100-mesh and about 25 percent passing the 200. In blending about 3 percent by weight of this material with ordinary concrete sand, a product is produced with an analysis of 98.7 percent minus No. 4, 76.2 percent minus No. 16, 17.6 percent minus No. 50 and 5.4 percent minus the 100. These average figures come well within Federal requirements.

At present, all shipments of blended sand on the government project are being made by railroad cars loaded from a tipple fed by a 28-in. belt conveyor. To permit water shipments, the conveyor is being extended for barge loading.

In blending, the two adjacent hopper bottoms of the two-compartment bin feed by gravity to separate con-



Constant weight feeders proportioning ground with unground sand to carloading belt which may be seen below. This conveyor is being extended for barge loading

stant weight feeders which are adjustable. The feeders discharge together continuously into a mixing box which is an open-bottomed small hopper with baffles that lays the material on the loading belt. A strike-off blade at the loading point further mixes up the sand.

It is necessary to take frequent sieve analyses of dredge run sand as it arrives in barges and of the pulverized sand and finished product in order to make proper adjustments of

Above is the table feeder which is regulated by an "electric ear" on the mill

the blending feeders, to insure against car rejections at destination. Sieve analyses made on the dredge itself are a check against delivery of material too high in the minus 16-mesh fraction to the blending plant. Loading is done in two piles in bottom-hoppered railroad cars.

One of the difficulties solved by experience was that of securing a continuous regular flow of the fine material from the bin to the feeder. Three ⅝-in. diameter steel bars, set close together horizontally through the throat of the bin, two turning in the opposite direction to the other, are used to prevent arching and subsequent flooding. A car of 60 tons of blended sand is loaded in 35 minutes.

It is estimated that the blended sand costs 10c more per ton over regular concrete sand by this process, but the ability to produce sand with such fines has resulted in gaining several sizable contracts. It is reliably reported that the blended sand produced has met with the thorough approval of government engineers. Upon completion of these contracts, the Iron City Sand and Gravel Co. will be equipped to produce any specified requirement in fines.

C. A. Bickel is manager of operations for the Iron City Sand and Gravel Co. and W. A. Mahan is superintendent of the blending plant.

Announce Safety Contest Winners In Sand and Gravel Industry

BUREAU OF MINES has announced the winners of the 1939 safety contest among sand and gravel producers which has been conducted in coöperation with the National Sand and Gravel Association. The two bronze trophies provided by ROCK PRODUCTS for the best records were awarded to the Van Sciver lake plant of the Warner Co., Philadelphia, Penn., and the Oxford dry-bank plant operated by the Ray Industries, Inc., near Oxford, Oakland county, Mich. The Van Sciver plant, winner in the 100,000 man-hour group, operated 142,982 man-hours without a disabling injury. The Oxford plant, winner in the less than 100,000 man-hour group, operated 59,655 man-hours without a disabling injury.

Seventy-seven plants were entered in the contest, more than for any previous year. The accident-frequency rate for the entire group of 77 plants was 26.1, comparing favorably with the rate of 26.7 for 1938. The accident-severity rate of 5.8 was somewhat worse than the 1938 rate of 4.85.

Of the 77 plants enrolled in 1939, 40 operated with perfect safety records. One plant in the large group and 37 plants in the small group were awarded certificates of merit for operating without a disabling injury. Those receiving certificates were as follows: Consolidated Rock Products Co., Monrovia, Roscoe and Orange, Calif., plants; American Aggregates Corp., Oxford, Mich.; Fort Worth Sand and Gravel Co., Quigley plant, Hurst, Texas; The Sturm and Dillard Co., Circleville, Ohio; Lyman Richey Sand and Gravel Corp., Louisville, Valley, Fremont (2) Plattsmouth, Columbus, Bridgeport, Central City, and Grand Island, Nebr.; Stewart Sand and Material Co., Turner, Kan., and Kansas City, Mo.; The Negley Sand Co., Negley, Ohio; Eastern Rock Products Inc., Frankfort, Barneveld, and Boonville, N. Y.; Wyoming Sand and Stone Co., Falls, Penn.; Graham Brothers, Inc., El Monte, and Orange, Calif.; Pittsburgh Plate Glass Co., Creighton, Penn.; Portland Sand and Gravel Co., Portland, Penn.; Industrial Silica Corp., Utica, Penn.; Erie Sand and Gravel Co., Erie, Penn.; Sand Products Corp., Muskegon and Manistee, Mich.; General Concrete Products Corp., Warren, Penn.; The Schmidt Bros. Sand and Supply Co., Garfield Heights, Ohio; Steiners Washed Sand and Gravel Co., Ludlow Falls and West Alexandria, Ohio; The Cleveland Builders Supply Co., Garfield Heights, Ohio; Ray Industries, Inc., Rochester, Mich.; Laval Sand Co., Fort Gay, W. Va.; Cleghorn Corp., Longwoods, Md., and Arkansas River Sand Co., Sand Springs, Okla.

Lime Protest Meeting at Washington

The Editor: I note an article entitled "Lime Manufacturers get a Hearing" on page 95 of the August issue of ROCK PRODUCTS. I would like to make the following comment regarding my statement at the hearing as expressed in this article. As I recall it my statement made to Mr. Bates was as follows:

"The Finishing Lime Association of Ohio did not request this hearing, but inasmuch as this hearing deals with the specification of lime, we are interested in these proceedings and also take this opportunity to make a statement concerning the new specification.

"We do not believe that the adoption of the revised specification will cure all of the troubles that are experienced in plaster work. Through our research work at Battelle Institute we believe that there are other reasons for the so-called failure of plastering than those which have been advanced, and which have resulted in this new specification. The research work is going to be continued and when we have definite information which will be of interest to this specification board we will seek an opportunity to present it.

"We have developed ways and means of producing a lime meeting these requirements and an experimental plant is now in operation. We have found, however, that it is impossible to obtain any commitments as to delivery for new equipment at this time due to the defense program. Therefore, we are asking that the effective date of these specifications be postponed to enable the lime manufacturers to obtain the necessary equipment to produce lime meeting these requirements.

"There are representatives of other manufacturers present who, I believe, will bear me out as to the seemingly hopeless task of obtaining delivery dates on the equipment necessary to produce it."

L. E. JOHNSON,
Secy. and Gen. Mgr.

Surface Current Classifiers

Article 16 shows how this type of classifier is adaptable for making various fine gradings

By EDMUND SHAW

SEVERAL BOXES for recovering fine sand were designed by the writer, and one of them was described in the 1929 edition of his book.* The illustration, Fig. 3, is reproduced herewith. It was designed to make core sand, and a movable partition permitted the amount of fines in the product to be controlled. A gentle upward current of water from the pipe in front of the partition kept the fines from settling in the eddies which are always present where the water flows over a partition. Built for a flow of 600 g.p.m. of water, the box was 8 ft. wide and 12 ft. long. It was designed to save everything coarser than 100 mesh and some of the 100 mesh particles. The depth was made 8 ft. as this height was available.

A feature is the removable longitudinal partitions. These permit the current to be narrowed down, throwing more fine sand over the partition. It is easier to change these long partitions than it is to move the cross partition. The reason for providing these means of changing the classification is that different customers for core sand have different ideas of the grading wanted. In one box which the writer designed, Fig. 4, the partitions were changed to make asphalt sand and moulding sand, which had different gradings.

The use of inclined baffles may make it possible to use a box of considerably less area. The utility of inclined baffles for particle classification has been known for a long time, but the writer has never known of their being used to settle fine sand. In every case known, it was attempted to settle all the solids, clay as well as sands. They would settle the heavier solids better but the light clayey material went to the overflow just the same.

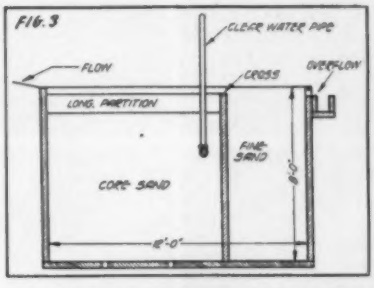


Fig. 3. Settling box having longitudinal partitions and a pipe for admitting clear water

The graph, Fig. 5, was made from the results of tests made by the Anaconda Copper Co. with a box 9 ft. long, 3 ft. wide and 3 ft. deep. The flow was admitted at one end and ran over the inclined baffles which were set just far enough below the current so that no ripples showed on the surface, Boards at the ends permitted the current to be raised and lowered to this end. The curve shows that when the feed was increased to three times what it was at first there was not much decrease in the percentage of solids settled.

Investigation has shown that a current is set up on the upper side of the baffles by the force of the current above. This carries the solids down. The rising current on the lower side of the baffle is so weak that it cannot lift the solids, or can lift only the finest solids.

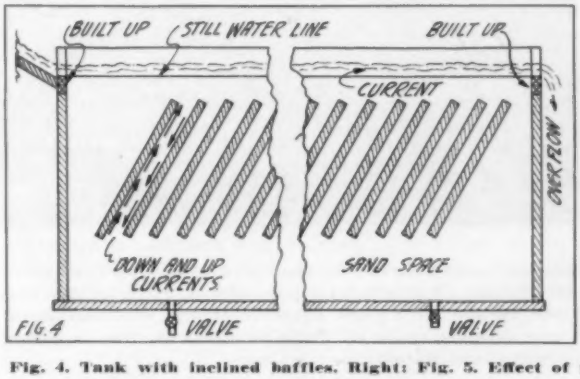
Best results have been obtained with baffles set 60 deg. from the horizontal and 3 in. apart. They may be made of wood or some thin metal, like galvanized iron.

A settling box of this kind is a surface current classifier, so its required area may be figured as described in preceding articles of this series. Assuming that 60 tons per hour of sand is going through the plant, not more than six tons will ordinarily be sand finer than 65 mesh which it is desired to save. If the original dilution was 6 to 1, allowing for losses there will be perhaps 330 tons of water with this six tons of sand. However, all the clay will be with it, and this may bring the percentage of solids up to 10 percent. Figuring as described in previous articles, this is a feed of 2.9 cu. ft. per second. If it is desired to save grains as small as .07 mm., (200 mesh) the rising velocity should not be more than 4 mm. per sec., or .0132 ft. per sec. The required area then (from $Q = av$) would be 2.9/.0132, or 220 sq. ft. A box 6 ft. wide would have to be about 37 ft. long to give this area.

If only a little minus 200 sand was wanted, the box could be half the size and catch most of the 100 mesh grains, and a box 4 ft. wide and 27 ft. long would do. If only half the 100 mesh grains were wanted a box 4 ft. wide and 22½ ft. long would do.

(Continued on page 30)

* Sand Settling and Devices for Settling and Classifying Sand, by Edmund Shaw.



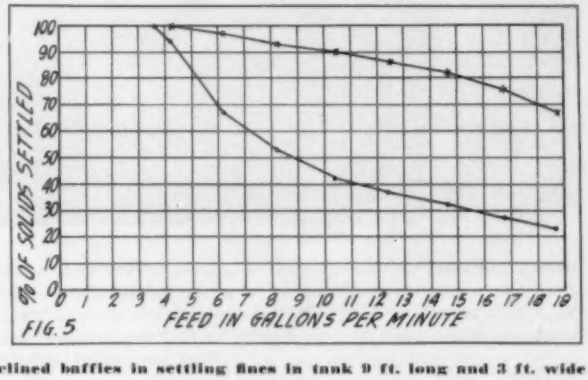
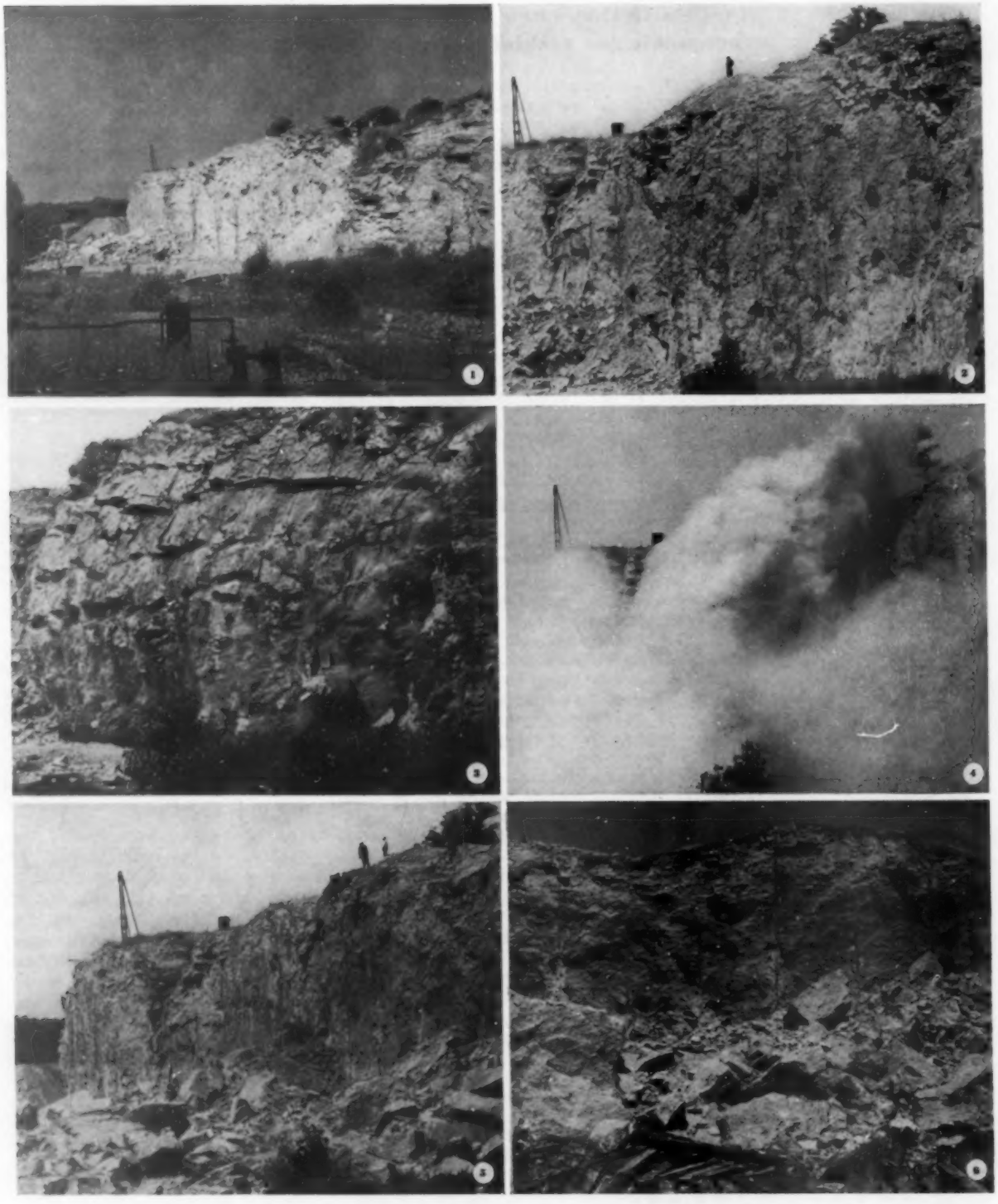


Fig. 4. Tank with inclined baffles. Right: Fig. 5. Effect of inclined baffles in settling fines in tank 9 ft. long and 3 ft. wide

SIX "SNAPS" OF A QUARRY BLAST



Before and after pictures of blast at quarry of The Moores Lime Co., Springfield, Ohio. The "shot" was of 10 holes about 45 ft. deep, 16 ft. back of face, and 14 ft. apart, bringing down 9900 tons of stone. Explosives included 1050 lb. Hercules Gelnmite No. 1, 5- x 16; 950 lb. E. P. 81B, 5- x 16; and 1000 ft. of Primacord. The pictures were taken by W. H. Moores, secretary of the company. Figs. 1 and 2: Face before blast. Figs. 3 and 4: Two views of blast taken at 1000th of a second. Figs. 5 and 6: Face after blast, showing excellent fragmentation

Cement Executives Give Views On Bin Problem

By NATHAN C. ROCKWOOD

Battery of silos like this was once considered ample provision for storage

A STANDARD TEXTBOOK on highway materials, published in 1928, states: "The chief requirements [for portland cement] are soundness and ability to gain strength when used in concrete or mortar." Apparently those are still the chief requirements; but very complicated methods have since been evolved to test or to attempt to assure these requirements. Concrete pavements were more popular in 1928 than they are today, and many of those built then were as good as can be constructed today.

Since then—in the last 12 years—a lot of things have been learned about causes of unsatisfactory concrete; and now, rightly or wrongly, most of the attention is focussed on the cement ingredient. So we have come officially to recognize five types of cement on the theory that no one type will meet all the requirements desired. Thus an industry founded and grown great on a single standard product is faced with the problem of recognizing, making, storing, packing and shipping at least five standards.

Everybody might still be happy if the five standards covered all demands, but in the course of acquiring knowledge about the peculiarities of portland cement, various purchasers developed their own peculiar methods of tests—and some went so far as to specify methods of manufacture. Whether methods of manufacture are specified or not, these purchasers think they get cement made especially for their exclusive use. And instead of five types or kinds of cement the hapless manufacturer often finds himself operating as though he were producing as many as 20 or more varieties.

The normal efficient way to operate a cement plant is to run continuously, putting into storage the excess production until all the storage capacity is utilized—usually about 25 percent of a capacity year's requirements. At some eastern plants where the demand for special cements, or especially tested cements, is causing manufacturers gray hairs, operation is beset with difficulties. Witness a single actual example: A plant has 44 silos, holding 272,000 bbl. It is regular practice to have 36 of the 44, representing 194,000 bbl. of capacity (71 percent), tied up for purchasers of these special or especially tested cements.

Fortunately, this is not yet a general condition. As one goes west he finds purchasers not so finicky, and consequently plant operation is on a much more normal basis. It is to be hoped of course that the adoption of the five varieties of portland cement will help to eliminate some of these specials, but there is no apparent willingness on the part of purchasers to forego their present advantage of specifying special cement and having it set aside to use when and as they please.

The situation outlined is hardly justifiable from any angle because, in the first place, the user, or specifier of cement, is not getting a special product from a reputable manufacturer. Such a manufacturer is putting out as good cement for all his customers. In some cases every barrel of cement made is tested by an independent laboratory for the manufacturer, so that he has assurance that his product should pass *any reasonable* test. Nevertheless there exists a general belief on the part of most large users that much cement made is not up to their own standards and will be worked off on the unsuspecting.

The user is not inclined to sympathize with the manufacturer in regard to the "bin problem," because it is contended that the manufacturer himself is largely responsible for the condition through his willingness to set aside a bin for the exclusive use of this or that customer, in the competition for business when business is scarce; and inferentially if not directly he is promoting the belief that the customer is thus getting something special in the way of a product.

Manufacturers' Suggested Remedies

Remedies suggested by executive officers of cement companies include:

(1) Make a charge of a certain amount per barrel of cement to pay for bin rental.

(2) Let tests for all purchasers of the same specification cement be made into and out of the same bin.

(3) Get all purchasers to agree to accept the tests of some one laboratory.

(4) Let the Federal Government step in and put its stamp of approval on a bin from which all purchasers might draw.

A remedy suggested by representative large purchasers is:

(5) Use of carload tests made in conjunction with an understanding with the cement manufacturer that the release of shipments will be expedited so long as no rejections are necessary.

Most cement company executives with whom we have corresponded believe (1) the best way to meet the problem. But to make effective a rental charge for bin service would require unanimous acceptance by the cement manufacturers and since it would affect the price of their product, they would be inviting still more federal investigation. And, of course, as various executives point out, anything like unanimous acceptance under present conditions seems impossible. It might come about naturally if and when the industry enjoys another "sellers' market."

Testing From Same Bin

Suggestion (2) several executives believe to be the most practical. Unless specifications differ radically we see no objection to as many laboratories as the purchasers may employ doing all their testing on the same bin of cement—as a matter of fact in most cases they are testing the same cement anyway. They could still be paid on the basis of the amount of cement used by their client; they might have to sample more cement, but even that could be done more scientifically without necessarily taking more samples. Moreover, from a scientific angle comparison of test results from various laboratories on the same bin of cement would be most enlightening.

Suggestion (3) is probably out regardless of any merit. Numerous testing laboratories thrive on this business and to have a single laboratory designated to test the product of any one plant—designated either by the manufacturer or the customers—would, as one cement executive puts it, cause the laboratories not favored "to raise hell." The only way it could be done probably is for the laboratories themselves to get together and assign certain plants to certain laboratories; but even here there are almost insuperable difficulties because cement users have serious doubts as to the reliability or uniformity of some laboratory test results on cement, even as some laboratories doubt the reliability and uniformity of some of the cements they test!

Suggestion (4) that the Federal government might test and certify all cement is not considered practicable for the same reason that suggestion (3) is impracticable. Too much private business would be displaced by a government bureau; and most cement manufacturers are not inviting any more government supervision of their business. An alternative would be for the cement industry itself to set up a testing, certifying and policing bureau to make sure no manufacturer put out a product that would bring discredit on the industry. This undoubtedly would be a good thing for the industry, but its installation would be very difficult.

Purchaser Acceptance On a Plant Approved Basis

Suggestion (5) is one that is based on actual practice in many midwestern and Pacific Coast states for cement for highway departments. In Indiana, for example, the State Highway Department has what it terms an approved list of plants. Samples are taken from every car as loaded. However, the cement may be used immediately as received on the job, unless and until the samples fail to meet requirements. In that event the cars would have to be held until the cement was definitely and finally approved or rejected.

The Texas State Highway Department operates along similar lines except that the practice is a little more severe. Here if the cement does not come up to specification test, the mill from which it was shipped is placed on a "delayed acceptance basis." In other words, the cement from this mill will no longer be accepted on faith, but must be finally tested before shipment. The mill at fault will be kept on that basis until its product is improved sufficiently to justify the purchaser restoring it to the approved list.

One cement executive says: "This method, from our own experience, looks as if it has some merit. The manufacturer is more interested in producing the proper quality than any one else, and is better equipped for the control and testing of quality. If it has been once established that his particular mill can meet a certain specification, the purchaser takes very little risk that all the cement shipped to him will not be up to or exceeding the specification. Under this plan storing and testing can be put on a very practical basis as far as the mill is concerned, and we believe it would be an effective and economical method of control for the purchaser."

We ourselves think this method is the most practical and the most logical method suggested. It places squarely on the individual manufacturer the responsibility of maintaining the quality and reputation of his product without the customer attempting to dictate the manufacturing or control methods to be employed. The incentive to maintain quality is sufficient without being unjust. When we compare some of the concrete highway jobs in the Middle West and on West Coast with those in the Eastern States, our own opinion is that the cement purchaser acts wisely to let the cement manufacturer control his own quality, merely making sure that he does.

We will continue our discussion of the "bin problem" with a digest of the other side of the picture from laboratory testing engineers and representative users in a later issue.

Surface Current Classifiers

(Continued from page 27)

These are areas that may be obtained with ordinary commercial machines, and some of the larger tilting tanks and automatic discharge tanks are being successfully used for the purpose. But because of the small quantity of solids it is the writer's opinion that some type of drag or screw machine would be better, and the screw does not lend itself well to use in a large tank.

When this article was first written it was suggested that manufacturers should put a machine on the market which would have a large settling area combined with a light drag mechanism. There are several manufacturers who make drags with large settling areas, 200 sq. ft. or more, but the mechanisms, which are designed to handle 80-90 tons per hour, are too heavy and expensive. A description of just such a drag as had been suggested, installed at the Eliot, Calif. plant of the California Rock and Gravel Co., was described in *Link-Belt News*, February, 1939.

The material it was desired to save is unusually fine, from 80 mesh to 200 mesh, and the required area was found by making settling tests. The tank is very large, 14 ft. wide and 30 ft. long and 8 ft. deep. The feed is 1200 to 1400 g.p.m., which averages about 2.88 ft. per second. With a 14-x 30-ft. tank the rising velocity would be practically 2 mm. per second, which would allow 200 mesh grains (vel. 4 mm.) to settle.

The tank is constructed with baffles that prevent any boils or eddies from forming with the incoming feed, and a long overflow weir is provided to prevent the formation of local currents. The drag mechanism is so light that only 2 h.p. is required to operate it. A special feature is a wiping device to keep the drag plates clean, invented by Mr. Stevens, the gravel company's technician.

(To be continued)

Preventing Fires in Plants

Fire fighting equipment, sprinkling systems, and employe instruction and supervision outlined in concluding article covering cement industry survey

By A. J. R. CURTIS*

FIRE extinguisher chart No. 2 provides data covering the distribution, inspection and maintenance of the first aid fire appliances covered in chart No. 1, shown in ROCK PRODUCTS, May, 1940, p. 39. It is particularly important that instructions for maintenance be carefully followed so that extinguishers will always be fully charged and that they be in their proper places at all times, and in a condition which will permit efficient operation without delay. Recharging should be done carefully in accordance with instructions from the manufacturer.

Soda-acid extinguishers, not represented in charts No. 1 and 2, should be distributed the same as non-freezing extinguishers and inspection procedure is the same. Sulfuric acid used in them has a freezing point of approximately 29 deg. F. below zero. The acid is very hygroscopic, however, and its freezing point rises rapidly with absorption of moisture, reaching its highest value at 46.4 deg. F. with approximately 8 percent absorption. The proper acid bottle stopples should always be used to close the bottle opening reasonably tight and to insure that the acid remains of proper density.

Pump tank extinguishers, which also are omitted from charts No. 1 and 2, are suitable only for fires in ordinary combustible materials and where fire pails could not be used effectively. They are particularly useful in extinguishing overhead fires that are difficult to reach with a fire pail. This type is a cylindrical tank of 2½- or 5-gal. capacity provided with a vertical force pump inside, discharging a stream of water 35 to 40 ft. through a short length of hose. Two men can operate it more effectively than one, one pumping while the other directs the stream. The tank cannot be moved while pumping, but can easily be refilled even while pumping. Discharge can be started and stopped as desired. It can be filled with calcium chloride solution and used in locations subject to freezing temperatures.

Pump tanks may be used on class A fires where quenching action is needed to supplement the non-freezing hand extinguisher in the hands of a single operator, one 5-gal. tank for each 2000 to 3000 sq. ft. of floor area. They should be inspected weekly to make sure they are full, and the pump should be operated once a month. Contents should be completely discharged annually and thorough examination made of the pump. Of course, the stream is a conductor of electricity and should not be used on live apparatus.

Fire Hoses and Sprinkler Systems

Fire fighting is divided naturally into two parts: immediate use of first aid fire appliances, and the use, if needed, of additional apparatus by the plant fire brigade or public department. Chief need for fire hoses and sprinkler systems in most cement plants is in bag storage, storeroom and wooden buildings such as the office or laboratory.

The standard unit of small hose is a 50-ft. length of 1½-in. unlined linen hose of approved brand, equipped with a ⅜-in. nozzle without handles or shut-off. If shut-off nozzles are used, they should be well oiled and left open. Small hose should be attached to risers independent of the sprinkler system so that it will be available when sprinklers are shut off either for repairs or after a fire. It should be kept on convenient racks located so that all parts of the protected area can be reached by at least one stream. After it has been wet, linen hose should be thoroughly dried so that it will not mildew. Hose and valves should be inspected periodically.

Sprinkler systems might well receive more consideration for use in bag storage and storerooms than reports indicate is now the case. It is suggested that these systems be discussed with fire risk inspectors and carriers for an estimate of their favorable effect on the insurance rate. Installation of sprinkler systems in the storeroom of a cement company resulted in a substantial reduction in the fire insurance premium. Of course, protection against freezing is a major item in connection with sprinklers.

To assist employes in selecting the proper extinguishing equipment promptly, it is recommended that fire appliance stations be conspicuously located and identified. Since workmen may not in an emergency take time to read the identifying data stamped on extinguishers by the manufacturer, it is suggested that the area behind and around the extinguisher be painted a bright, distinctive color. Bright red would indicate that the extinguisher is for use on "ordinary," or class A, fires in combustible materials. Bright yellow would indicate that the extinguisher is for use on electrical, or class C, fires. A third color would designate foam extinguishers for fires in flammable liquids.

It is recommended that fire stations throughout the plant be numbered and that the date of purchase, placement, inspections and recharging be entered on the tag attached to each piece of equipment. A check list of the stations with duplicates of the information on the tags would show at a glance exactly what protective equipment is in use in the various locations and the care it receives. Changes in locations should be noted also, with dates and reasons for the change.

Employe Instruction and Supervision

Protection of fire extinguishing equipment against freezing has been discussed in preceding sections. This equipment should also be protected against dirt and dust to keep it in perfect operating condition. Tight cabinets, painted the distinctive identifying color with the words "FOR FIRE" on the doors, have proved successful in keeping extinguishers in top shape in a number of cement plants. A simple expedient to keep dust and dirt from the orifices of extinguishers is to cover them with small pieces of paper held in place by rubber bands.

Approximately three-quarters of the cement plants supplying informa-

* Secretary, Committee on Accident Prevention and Insurance, Portland Cement Association.

tion about their fire protection programs reported that employes are individually and collectively instructed in fighting fire. Employes in all plants should be instructed in regard to the relation of fire prevention to their particular work and should be made familiar with the hazards involved.

Every employe should be taught where extinguisher stations in his workplace are kept, and his knowledge of their locations and proper use should be kept fresh by means of brief quizzes, given periodically. The foreman, safety man or the plant fire inspector can conduct quizzes of individuals usually in the course of the employes' regular work. Questions about hypothetical fires in various locations can be put and the workman asked to demonstrate as speedily as he can what he would do to extinguish them.

When a fire is discovered, prompt alarm, previously arranged for, should be given. When a plant is idle, the watchman should be able to give prompt alarm of fire in any part of the plant. If other employes are in the plant, he should be able to call them quickly. Prompt use of first aid fire appliances will often enable a watchman or other employe to stop a fire single-handed. Good judgment is necessary. Ordinarily, an alarm should be sounded at once.

Large plants, isolated plants or any plant having yard equipment should have a fire brigade of sufficient size and suitable organization to handle the fire equipment that is available. The value of yard hydrant protection depends largely on how effectively it is used in an emergency.

Fire pumps should be started as soon as an alarm is given, at any hour of the day or night. Forgotten fire pumps or valves shut or valves "shut-in-winter" do not extinguish fires. The program should also include careful study of the intelligent manipulation of sprinkler systems. Watchmen and other idle-plant employes should know the valves and how to use them properly.

A complete plan for quickly calling the public department for a fire in any part of the plant should be worked out and properly publicized. Small fires can grow into large ones if the public alarm is not sent in promptly. Arrangements should be worked out and drilled into night employes as well. Fire drill is important, for men "learn best by doing."

With the possible exception of coal storage, all fires likely to occur in cement plant locations may be extinguished within the first few minutes by prompt action of employes who know how to use first aid fire appliances.

Therefore, appointment of a plant fire supervisor, or chief, to head plant organization for fire protection can not be too strongly urged. Such individuals should be directly responsible to the plant superintendent and should receive his full support.

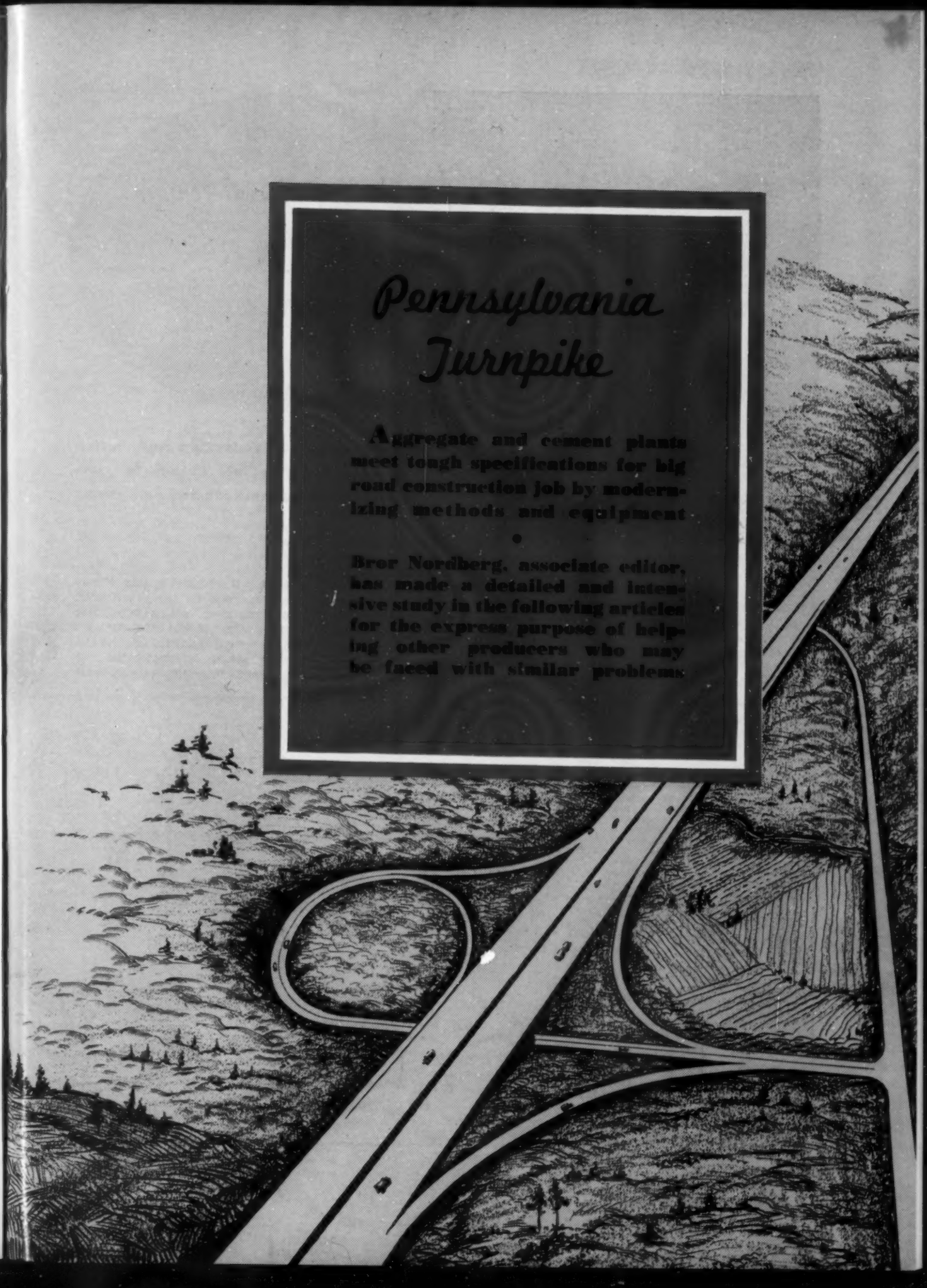
Instruction of employes should include:

1. Careful personal habits, smoking, use of lights, torches.
2. Equipment maintenance to prevent overheating.
3. Prompt alarm in case of fire.
4. Speedy, efficient use of proper fire fighting equipment.
5. Complete plan for quickly calling the public department, if available.

This report was developed as the result of several months' study by the subcommittee on fire protection hazards, appointed early in 1939 by Chairman John J. Porter of the P.C.A. committee on accident prevention and insurance. The sub-committee group includes P. N. Bushnell, manager, department of Personnel and Safety, Missouri Portland Cement Co., St. Louis; M. P. Greer, safety engineer, Marquette Cement Manufacturing Co., Cape Girardeau, Mo.; A. G. Lang, superintendent and chief engineer, Pacific Portland Cement Co., Redwood City, Calif.; and Claude McMillan, safety engineer, Oklahoma Portland Cement Co., Ada, Okla. W. W. Deadman, superintendent, Lone Star Cement Corp., Norfolk, Va., also coöperated in preparation of the report.

FIRE EXTINGUISHER CHART NO. 2—DISTRIBUTION, INSPECTION, MAINTENANCE

TYPE	NON-FREEZING	FOAM	VAPORIZING LIQUID	CARBON DIOXIDE
DISTRIBUTION	One 2½-gal. extinguisher for every 1500 to 2000 sq. ft. of floor area. 20- and 40-gal. extinguishers may be located at convenient points for handling larger fires or taking care of special hazards.	Near containers of flammable liquids. Rated extinguisher capacity of 1 gallon for every 2 sq. ft. of flammable liquid surface. This will theoretically give a 6-in. foam blanket.	For power houses, near large electrical units or grouped electrical equipment, provide large size extinguishers. Locate well away from high temperatures.	Near each important item to be protected. For power houses, near large electrical units or grouped electrical equipment, large tanks or containers of flammable liquids, provide large size extinguishers.
INSPECTION	**Weekly**—See if in place. **Monthly**—lift to see if full, nozzle is clear, extinguisher appears to be in satisfactory condition.	**Weekly**—See if in place. **Monthly**—lift to see if full, nozzle is clear, extinguisher appears to be in satisfactory condition.	**Weekly**—See if in place. **Monthly**—lift to see if full, nozzle is clear, etc. Air pressure type: keep pressure at 100 lb. per sq. in., test recording gage.	**Weekly**—See if in place, nozzle clear. **Semi-annually**—Check weight. If net weight of carbon dioxide is less than 90 per cent of that marked on extinguisher, it should be recharged.
MAINTENANCE	**Annually** — Empty and check contents carefully as prescribed by manufacturer, replace contents. See that specific gravity of all chemical solutions is within specified limits, all ports and tubes are free from corrosion, sediment or crystallized salt. Every 3 years: operate, wash, recharge with new charge.	**Annually** — Discharge and recharge. Inner container, stopple and interior of cylinder should be thoroughly cleaned, hose flushed out to remove foam or adhering salts. Make sure holes in discharge outlet screen are free.	**Annually**—Unnecessary to recharge periodically, but test operation once a year by pumping liquid from extinguisher. Collect liquid in clean, dry container, return to extinguisher after pump parts and washers are carefully inspected for corrosion.	See above regarding weight. It is not necessary to recharge carbon dioxide cylinders periodically. Extinguishers should be recharged promptly after use, however, even though entire contents have not been discharged.
SPECIAL	Acid bottles—see if properly charged and not cracked. If acid is more than ⅛ in. above filling level mark, new charge should be provided.	Only charges furnished by the extinguisher manufacturer should be used. Follow directions on package, taking particular care that all chemicals are thoroughly dissolved.	When testing pump type, point extinguisher both up and down to make sure that internal pump takes suction from both ends of tank.	Recharging can be done from commercial cylinders by means of recharging kit furnished by manufacturer, or extinguishers may be shipped for recharging to any plant manufacturing carbon dioxide.


Pennsylvania Turnpike
Aggregate and cement plants meet tough specifications for big road construction job by modernizing methods and equipment
•
Bror Nordberg, associate editor, has made a detailed and intensive study in the following articles for the express purpose of helping other producers who may be faced with similar problems

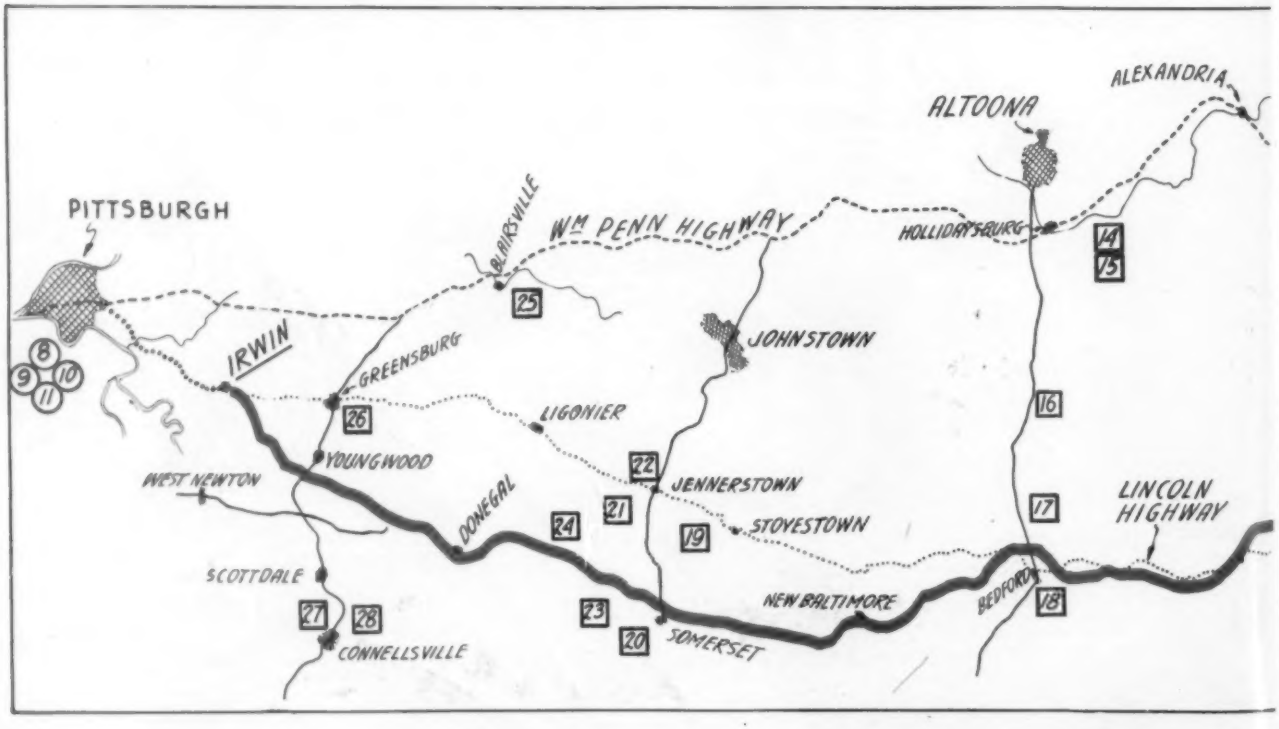
Turnpike Sets *NEW* Standards

High rates of production and better quality of materials called for improvements in methods and equipment

Typical construction scene at tunnel location

AMERICA'S GREATEST single achievement in concrete highway construction is the Pennsylvania Turnpike just completed. This superhighway, connecting Pittsburgh with Harrisburg, was finished in the record breaking time of 21 months, which would have been impossible without complete coördination of the activities of the engineers, the contractors and the producers and manufacturers of necessary materials.

Specifications for aggregates were difficult to meet and were the means of getting the highest quality of materials available for the job. Written into these specifications were some new requirements that naturally were difficult to attain particularly for the small producers of aggregates who had to outfit themselves to meet these



standards and make deliveries at a pace far beyond anything they had ever experienced.

Those small plant operators who produced large tonnages could never have fulfilled the requirements had they not organized their assets and made certain necessary equipment changes in their plants. Equipment had to be installed for added capacity which would enable the production of higher quality aggregates and insure continuous production.

The Pennsylvania Turnpike will likely be the forerunner to other similar super highway construction in the near future which will be constructed to similar rigid standards and it is not at all unlikely that equally stringent specifications will be applied to other road construction. It already appears likely that this highway will eventually be extended to Philadelphia and that other producers will be faced with similar problems. It is for that reason that emphasis is herein placed on these specifications and the selection of equipment that helped producers to adjust their plants to meet them. At any rate, engineers of the Pennsylvania Turnpike Commission are of the opinion that their specifications contained standards for quality and grading that materially improved the quality of the concrete.

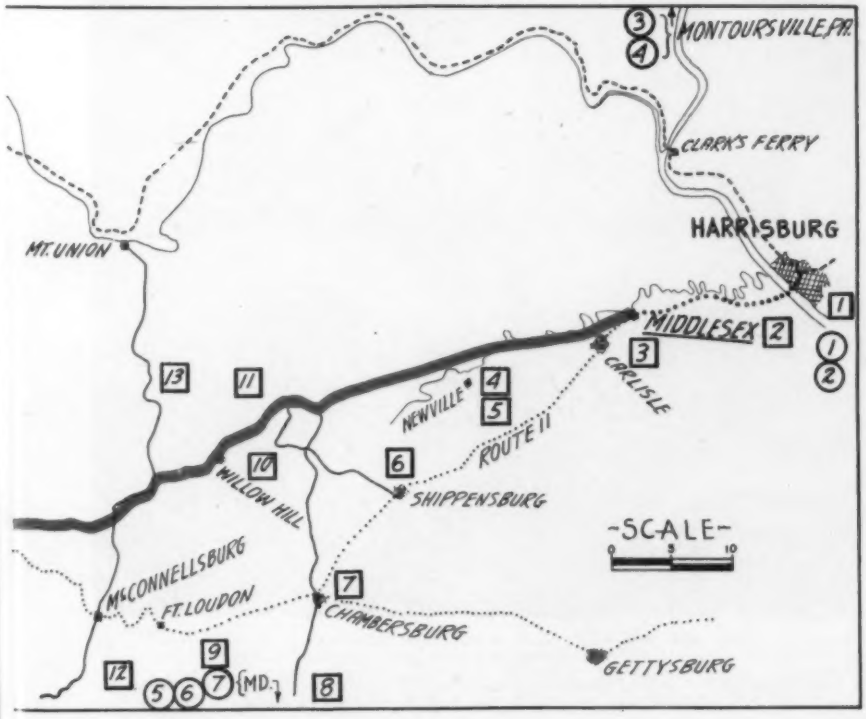
Contractor's set-up, showing how aggregates were handled and concrete was mixed

Requirements for Materials

To build the Pennsylvania Turnpike required 2,028,585 bbl. of portland cement, 1,391,361 tons of crushed stone and 843,887 tons of natural sand. Based on expected working days, the daily requirement was for 57,261 bbl. of portland cement, 38,933 tons of crushed stone and 22,583 tons of sand to complete the 160 mile four-lane highway on schedule. Moving these daily requirements meant the use of 191 cars for cement, 242 for stone and 779 for sand.

Considerable preliminary and exploratory work was done in advance of actual construction to determine the availability of suitable materials and to give Turnpike engineers the assurance that sources of supply were adequate for the construction demands. No acceptable sand for fine aggregate was available along the route of the Turnpike so this material was produced and shipped from distant points. Practically all the sand (90 percent) was shipped by rail from the sand producing areas at Pittsburgh and Williamsport, Penn., and Baltimore, Md., and a small amount was trucked from plants in the Harrisburg area.

On the other hand, good quality of limestone was available along the entire route of the Turnpike within trucking distance, but many of the plants were not equipped to get out



A guide to location of plants producing aggregates with relation to the Pennsylvania Turnpike. Numerals in squares indicate crushed stone plants, and numerals in circles represent sand plants

Crushed Stone Plants:

1—Bethlehem Steel Co.
2—Hempt Bros.
3—J. F. Sours
4—E. E. Kough
5—All State Quarry
6—Shippensburg Stone Co.
7—Chambersburg Stone Co.
8—North American Cement Corp.
9—L. Fry
10—Concrete Material and Construction Co. (portable plant from Waterloo, Iowa)
11—Binkley Bros. and Ober
12—H. B. Mellott
13—Contractors Service Co. (temporary plant)
14—Gilden Co.
15—New Enterprise Stone and Lime Co.
16—New Enterprise Stone and Lime Co.
17—Concrete Materials and Construction Co. (portable plant)
18—New Enterprise Stone and Lime Co.
19—Pennsylvania Quarry Co.
20—Romesburg Stone Co.
21—Laurel Ridge Stone Co.
22—John A. McNeil
23—Somerset Limestone Co., Inc.
24—Hunkin Conkey
25—Gray Stone Quarries, Inc.
26—Adam Eidemiller
27—New Castle Lime and Stone Co.
28—Vang Crushed Stone Co.

Sand Plants:

1—Highspire Sand & Gravel Co.
2—Susquehanna Sand & Gravel Co., Inc.
3—J. A. Eck and Sons, Inc.
4—Lycoming Silica Sand Co.
5—Arundel Corp.
6—Harry T. Campbell Sons Co.
7—A. H. Smith
8—J. K. Davison and Bros.
9—Dravo Corp. (Keystone Sand Division)
10—Iron City Sand & Gravel Corp.
11—McCrady-Rodgers Co.

Equipment for loading out from stockpiles at a high rate of speed, New Enterprise Stone & Lime Co.

crushed stone to meet requirements for gradation and quality, and the capacity of existing small commercial stone plants along the route was far from adequate. That was the situation faced midway across the Turnpike where existing plants had no washing facilities and probably an average capacity of 30 to 50 tons per hour. Large permanent producers near the terminals had no difficulties in meeting the standards and easily produced their tonnage requirements.

Commercial Producers of Aggregates Got the Bulk

Approved sources of supply for fine and coarse aggregate were established by Turnpike engineers after careful study of records kept by the Pennsylvania Department of Highways Testing Laboratory and other sources of information. This survey verified that the production of a number of quarries along the central section of the superhighway was not sufficient, based on normal operation.

Turnpike engineers wanted to assure the individual contractors on the job of a constant flow of aggregates adequate for their needs in fulfilling each one's contract on schedule and without excessive charges for transportation. They also desired to place the business with established producers rather than with portable plants and contractors' plants insofar as was possible and in such a way that producing stone for the Turnpike would be profitable.

New Equipment Was Needed

This meant considerable field study of sources of supply and a lot of preliminary work with the producers, since handling tonnages so far in excess of normal business in a non-metropolitan area carried with it the danger of creating an over-capacity in plant operation that might be serious when normal business was resumed with completion of the job.

None of the producers along the central part of the route was equipped or even familiar with the problems involved in supplying high quality crushed stone to some of America's best contractors who had to have a constant flow of stone to keep high-speed, modern contracting equipment going. Job requirements were as high as 1000 to 2000 tons of crushed stone per day from individual plants, some of which had to furnish stone to as many as five contractors. A study of quarries and producing plants, for these reasons, resulted in not granting approval to some and approving some operations only in part.

Results of the preliminary work were such that about 90 percent of all the crushed stone used could be let to commercial operators. These producers successfully reorganized their operations, with needed revamping in some cases, and coöperated wholeheartedly with the contractors and the Turnpike Commission to get the job done. Much of the credit for satisfactory completion of the project was given by the Turnpike engineers to efforts of the producers of materials.

Aggregates were purchased by 25 different contractors each of which had his contract started so that all would draw to completion at approximately the same time. Weather conditions were such in the winter months that 140 miles of paving were left for the 1940 construction season, which gives some idea of the magnitude of the producers' obligations in guaranteeing delivery.

Contracts were awarded well in advance of the construction season in order to enable the contractors to arrange advantageous material con-

(Continued on page 56)

Above: Washing and classifying unit of Concrete Materials & Construction Co. at Spring Run, Penn.

Below: Secondary crushing and screening plant at Spring Run. Hopper of primary crusher may be seen at the left, in the background

SPECIFICATIONS
For Aggregates and Cement

Turnpike specifications expected to serve as model for other large road construction projects

SPECIFICATIONS for the aggregates were difficult since they set unusually high standards for quality and contained some requirements that were absolutely new. They are of particular interest since they are undoubtedly the forerunners of similar specifications producers elsewhere might meet up with. By insisting on absolute conformance to these requirements, Turnpike engineers believe they have obtained the best available in concrete and that their experience with these materials has been highly satisfactory. From the producer standpoint, the standards were difficult to meet but some of the requirements were definitely to their benefit as it all turned out. Many of the producers willingly admit that certain restrictions resulted in savings for them by the elimination of rejections and that these savings paid for the required expense. In other words, some of the clauses in the specification really recommended practices that, if properly followed, would insure acceptance.

It was specified that all shipments of aggregates be inspected and accepted, or rejected, before unloading at the contractor's storage yard and that questionable material not be unloaded and incorporated with previously accepted material, pending laboratory acceptance. It was further specified that any materials might be inspected at any time during the progress of their preparation and use.

Grading of Coarse Aggregates

The size and grading requirements of coarse aggregates for paving were:

PERCENT PASSING SQUARE SIEVES

	Specification 2B	3A
No. 4	0- 10	.....
½-in.	25- 60	.....
1-in.	90-100	0- 15
1½-in.	100	35- 70
2-in.	.....	90-100
2½-in.	.....	100

An innovation in the grading specification is that the coarse aggregate for paving concrete was produced in two sizes and recombined at the batching plants of the various contractors. These sizes, 3A and 2B, comprised the bulk of the output and were adopted in place of a single grading from the No. 4 to 2½ in. in order to prevent segregation. Specifications for the concrete were based on absolute volumes of material and segregation was one of the items over which control was sought in order to to have better control of the cement content and strength of the concrete and to hold voids to a minimum. Other changes new in this grading specification are unimportant. Producers are pretty well agreed that the production of two sizes of coarse aggregates was a benefit to them. At any rate, there were practically no rejections due to faulty grading.

Production was not seriously affected by this provision for two sizes. Changes consisted principally in the installation of needed screening equipment for the additional size split and to give required flexibility for the simultaneous production of other stone, additional crushers to balance the production of 3A and 2B, and additional needed stockpiling area. No particular emphasis was placed on devices at the plants to lessen segregation other than the use of baffles in filling bins and other devices ordinarily used by other commercial plants. Gradation followed closely the Simplified Practice Recommendations under consideration nationally by producers as well as the consumers.

It was further stipulated that the stone should have a percentage of wear of not more than 5 percent (Deval test) and a toughness of not less than 6 percent and that it be free from slaty texture or cleavage planes. Stone was required to meet a sodium sulphate soundness test and was limited to a maximum of five percent of thin or elongated pieces as determined on a sample representing materials retained on a 1¼-in. round hole screen. The specification contained no definition for elongated pieces and there evidently was little, if any, stone rejected for failure to comply. Additional crushing capacity installed in the various plants undoubtedly contributed to production of desirable shapes of stone particles. Deleterious substance was limited to 1 percent of shale or ¼ percent of clay lumps.

To produce sand during cold weather, plant of J. A. Eck & Sons, Inc., Montoursville, Penn., was enclosed and heated. Stacking belt and loading tunnel on right

It was specified that the stone be reasonably free from coatings of clay, silt or crusher dust, with the total loss by washing limited to 0.5 percent.

There were no particular difficulties encountered with these standards except the low percentage of loss in the washing test. Nothing in the specifications specified that a washing operation was necessary, but the limit of 0.5 percent loss made washing advisable for those producers who were unequipped, except in one or two cases where stone was mined or the quarry face was clean and relatively free from overburden.

Washing equipment was therefore installed in a number of plants. While

Truck unloading into new aggregates batch plant in center background with cement bin on the right. New Enterprise Stone & Lime Co. Batching equipment was operated for the convenience of the contractors

not required, this equipment made operation in inclement weather possible for some plant operators. Depending upon the presence of clay pockets and the extent of the overburden, some producers saw fit as insurance against rejection to pass all stone produced through the washing equipment. One or two operated without washing during the dry season and others put part of the stone through the washing equipment. Those who used their washing equipment found it unnecessary to clean off all overburden carefully, with some savings there, and did not have to exercise care in selecting stone free from clay pockets. In at least one limestone quarry, the operator, by installing modern scrubbing equipment, was able to reclaim and use for this highest type of specification material, stone laid aside over a period of years as unfit for use in paving. Producers found out that modern equipment does pay. Savings in not having rejected material more than paid for the cost of equipment that can serve the producer for years to come. The same reasoning applies in any commercial crushed stone plant.

Stockpiling and Stripping

As was mentioned earlier, limestone was the chief source of coarse aggregates because the Turnpike followed a course through limestone country. About nine miles of highway were paved in Westmoreland county at the Pittsburgh end using gravel for coarse aggregate. It was required that this gravel be washed at the plant prior to loading. Percent of wear on the Los Angeles rattler test was limited to a 35 percent loss on 500 revolutions and it was required to contain not less than 40 percent crushed particles.

Other requirements of particular importance were those which governed stockpiling. Producers were required to stockpile aggregates in an approved manner and, by following these regulations undoubtedly saved themselves a lot of rejections. The two sizes of coarse aggregates were to be stockpiled separately and in a way to prevent undue segregation and contamination. When considered necessary, they were supposed to be placed on wooden platforms or other hard and clean surfaces. Producing plants did not have to use planking, but some prepared storage areas covered with a crushed stone layer and limited reclamation from stockpiles to not closer than 8 in. from the ground. Where some kind of platform was used, which was done in a few sand plants, the producer was capable of recovering all his stockpiles. Stockpiles of coarse aggregates were largely built in horizontal layers not exceeding four feet in depth, with removal in the same manner. Cone stockpiles were not allowed, and some material so stocked had to be rescreened. Bulldozer equipment was used in some plants to help build these stockpiles.

To get uniformity in moisture content, it was considered desirable to handle materials for any one day's run at the batching plant either from bins alone or from stockpiles. This was done to get uniformity in moisture content to eliminate a lot of work in compensating for variations in moisture at the mixer. Some of the producers actually wetted material down (unwashed) as it was drawn from bins into trucks to approach the moisture contained in washed material, to help arrive at the desired moisture uniformity. This was usually done by applying compressed air first at 100 to 125 p.s.i. through the stream of dry stone as it fell over a perforated chute into trucks to remove dust and then applying water through sprays.

Since stockpiling in anticipation of the rush construction season was so necessary, a lot of trucks were used in building the stockpiles and modern loaders and shovels had to be purchased by some producers to insure that trucks hauling the finished product be kept moving without interruption.

Preliminary to the actual production of crushed stone, many of the plants stripped as much as 200,000 tons of overburden in advance, using power shovels and scraper-type equipment. Drives on existing equipment were modernized as a precaution for continuous uninterrupted operation.

Those with large contracts had to increase their quarry excavating and loading capacity by adding power equipment and by modernizing haulage equipment in some cases. Drilling equipment was added to by some and a larger number of blast holes shot simultaneously to increase output.

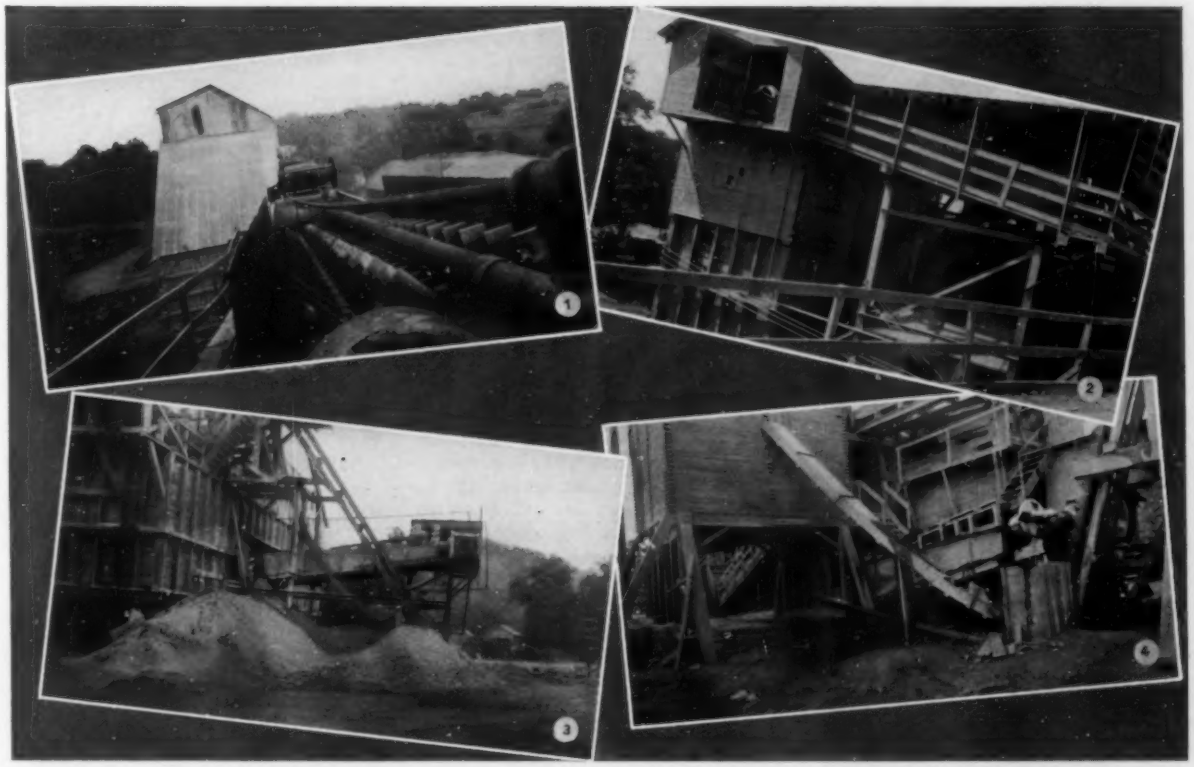
Some of the plants put in larger primary crushers, or opened the old ones up to give a higher capacity and followed this operation with more capacity in reduction crushers. Added equipment meant added power, which was usually unavailable locally, and Diesel engines were installed in several plants to drive equipment or to develop electrical power.

Labor Had to Be Trained

Labor was another item that had to be considered. One plant, for example, increased its personnel from 50 to 150 men in working a 24-hour day. Most of the new men were inexperienced, so it was necessary to stagger the working hours of the experienced men in order to have dependable men in the plant all the time to train the new.

Plants Better Equipped for Future

Now that the highway is completed, it is of interest to note what its construction did for the producers of crushed stone. Many of these producers had obsolete plants or plants which were in need of modernization or expansion before the Turnpike came along. The Turnpike meant profits for practically all and gave some the opportunity to earn needed money to improve and enlarge their plants. All the improvements made in these plants have been paid for and the operators are in a much better position to turn out better quality stone in the future. By having more efficient plants, some can produce



Typical washing plant installations showing various locations with respect to bins, screens, and crushers. 1—Stone from any plant bin is transferred into log washer by belt shown at feed end, Chambersburg Stone Co. 2—Washer located at the top of the plant, New Enterprise Stone & Lime Co. 3—Washer projecting out from plant structure. H. B. Mellott. 4—Concrete piers support washer above the ground at plant of Binkley Bros. & Ober

stone cheaper than before and will probably be able to reach out farther for other jobs in the future.

Looking back over the experience with the Turnpike, some very clean quarry faces have been developed that will better operating conditions in the future. Stone considered unfit before has been put through the washer and the mess cleaned up. Increased capacity is not nearly as much as one would expect since many producers will revert to the production of smaller stone where the increased capacity will be little more.

What Will be Done with Screenings?

What impresses one most are the vast stockpiles of minus 4-mesh screenings left over in piles of 15,000 to 40,000 tons at each plant. Unless some market is found for them, such as maintenance work, they will continue to stand for years to come. One plant is already grinding the screenings into agricultural stone through a ball mill which it had on hand previously for making agstone.

Sand Specifications

Natural sand was specified as the fine aggregate to be used and it was produced to the following gradation:

PERCENT PASSING	
3/8-in. square sieve	100
No. 4 square sieve	95-100
No. 16 square sieve	45-80
No. 50 square sieve	10-30
No. 100 square sieve	0-8

When subjected to the sodium sulphate soundness test (A.A.S.H.O. M.T.-104-38) the loss for five cycles was not permitted to exceed 10 percent. It was required that the sand be stockpiled for a sufficient length of time to permit drainage to a reasonably constant moisture content but in no case for a period of less than 12 hours.

This requirement of drainage did not affect producers seriously, since the bulk of the sand came from remote areas by rail which afforded plenty of opportunity for drainage in transit. About 10 percent of the sand was trucked from plants in the Harrisburg area, and these plants had to provide for a drainage period when used directly upon delivery. These plants only produced about 15,000-25,000 tons of sand each.

Very large producers of sand, such as the Arundel Corp., Baltimore, Md., and the large producers in the Pittsburgh area furnished about two-thirds of the volume. The other approximate third was produced by two medium-sized plants at Montoursville, Penn.

Gradation of the sand did not cause any difficulties since the specification was somewhat similar to those for other high grade highway construction. It tended toward a finer sand. Tolerances through 50-mesh were adopted to encourage about 20 percent through 50-mesh as compared to about 10 percent for other contracts filled by the producers. While there was no requirement for any material to pass 100-mesh, the permissible range of 0-8 percent would result in the production of a sand with a percent or more passing 100-mesh than before, assuming an attempt was made to split the tolerance. These slight deviations on the fine side resulted in only slight variations in the operation of sand classification equipment in the smaller plants. The larger plants, some equipped with fractionating and blending equipment, experienced no hardships at all.

An Individual Operator's Problems

On the coarse side of the gradation, all sand had to pass the 3/8-in. screen and the maximum to be retained on the No. 4 was limited to 5 percent. This meant some screen

changes to blank off more of the coarse material before passing the fines into classifiers.

J. A. Eck and Sons, Inc., Montoursville, Penn., operating a modern, Diesel-powered sand and gravel plant of average size, will serve as a good example of what took place in the average plant in producing sand. About 125,000 tons of sand were shipped from this plant by rail a distance of 100 miles.

Normally this plant produces about 100 tons of sand and gravel per hour, of which 50 percent is sand, and the principal demand is for sand. At times 80 percent of its volume of business is sand. In order to handle its Turnpike sand and still fill regular orders, it was necessary to operate when possible in the winter to build up stockpiles and to ship sand in advance for the contractors on the Turnpike. As much as 600 tons per day were shipped in the dead of winter and during the construction season deliveries reached a peak of 33 cars a day.

In an attempt to prevent accumulation of too large a stock of gravel, the deposit, which is excavated by power shovels, was worked as much as possible in the pockets predominating in sand. Haulage to the plant is by truck and the throughs from sizing screens are classified in a standard design rake classifier.

Normally this classifier discharged into bins of about 150 tons capacity. To supplement this storage capacity, a 24-in. stacking belt conveyor, 110-ft. centers, was installed onto which the classifier could discharge by means of a movable chute over the bins. The discharge end of the belt stands 65 ft. high over a reclaiming tunnel through which trucks were driven to receive sand from any of ten gates. Part of the time, the plant operated on a 24-hour schedule. Maximum sand carried in storage was 22,000 to 25,000 tons.

This plant had been rebuilt several years ago and is entirely enclosed, which was a great advantage in producing sand during bad weather. The lower levels of the plant have radiators which gave off sufficient heat to prevent freezing up of the equipment above as well. The pipeline for Diesel engine cooling water was run through the upper part of the plant and along the new belt conveyor, which was also enclosed, and helped considerably in preventing freezing.

At times it was necessary to pop shoot in the bank deposit, and to govern loading from stockpiles according to weather conditions. Ordinarily, in loading out trucks through the concrete tunnel, only the live storage was utilized, and the "cones" formed over the withdrawal points were replenished direct from the plant. The bins were used as much as possible for direct loading during cold weather.

The Turnpike came along at an opportune time, according to operators of this plant, to install stockpiling equipment already contemplated. Needless to say, large stockpiles of gravel were built up, but fortunately most of it is already being depleted on other work. All the sand from this plant was trucked a distance of three miles to a siding of the Pennsylvania railroad to take advantage of a freight rate differential of 20c as compared to the rate on the Reading railroad at the plant. Plant capacity was reduced about 10 percent on an hourly basis, partly because of minor adjustments to the screens. Some ⅜-in. material, which formerly went into sand, was crushed down into sand through rolls.

To sum up the problems involved in producing sand, the grading specifications and drainage requirements were devised to result in the production of a sand of uniform moisture content which would help to give better workability in the concrete and closer control of the mix. Turnpike engineers believe that results obtained by requiring a drainage period for sand were such as to point to a possible desirable requirement for a draining period for washed small sized aggregates in future work of this magnitude.

Portland Cement Specifications

Normal portland cement was used for practically all the construction, high early strength portland cement being used on the contractors' special request where he desired early form removal or had to meet some special condition. In that event its use required the approval of Turnpike engineers. In a few instances, quick hardening cement was specified.

All the cement was transported in bulk by rail and had to be shipped from manufacturers' bins previously approved by the engineer. Bins and silos were sealed and the cement had to be held 28 days while under test pending an acceptance report. Cement reclaimed from used bags was prohibited. The temperature of all cement at the time of delivery to the mixer was not allowed to exceed 125 deg. F.

It was further required that facilities be provided for sampling and inspection either at the mill or the site of the work and the Pennsylvania Turnpike Commission reserved the right to inspect or have designated laboratories inspect the full process covering the manufacture of all cement. An option was reserved to take check samples for the purpose of making tests to determine the quality of the cement and for such check samples to be used as the basis for acceptance or rejection regardless of previous decisions.

Samples of each lot were required to show practically uniform results of tests and marked deviation from such results might have been considered cause for rejection even though the test requirements be otherwise fulfilled. On fineness, the residue of standard portland cement was limited to 22 percent by weight retained on a Standard No. 200 laboratory sieve and the minimum specific surface area was 1600 sq. cm. per gram. Cement was not to develop its initial set in less than 45 minutes (Vicat needle) or 60 minutes (Gilmore needle), with the final set to be attained within 10 hours. To insure proper workability and finish at certain seasons of the year in concrete construction, the engineers reserved the right upon due notice to the manufacturer to lengthen the initial set required.

Low Temperature Cement

Two things in the specification were to the disadvantage of cement manufacturers, and that only because of the volume required—the low temperature of 125 deg. F. at delivery and the holding of test silos for 28 days. Neither of these requirements are new, but they caused difficulty in some cases because of unpreparedness or because the mills did not have enough storage capacity to hold test silos.

A number of plants in the Lehigh Valley and some in Western Pennsylvania and Maryland furnished the cement. A few made no attempt to get Turnpike cement orders because other business did not allow tying up additional silos under test, and a few mills were forced to give part of the Turnpike cement under contract to other companies.

It is generally known that portland cement placed in silos at about 200 deg. F. holds its heat six months or more without appreciable drop in temperature and this fact caused difficulty, unless orders were placed far in advance of shipment. Where this was done, and cement was put into silos during the cold winter months, no difficulty was experienced, but some mills were not so fortunate and had to go to considerable expense in attempting to cool the cement down to 140 deg. F. when loaded into cars.

The result was that there were some rejections at destination because the cement was too hot and these cars were held on the sidings until cooled sufficiently, demurrage charges being paid by the cement companies.

Cooling Cement

The few plants equipped with cement coolers had no difficulty. Others, using the Fuller-Kinyon system of conveying cement from grinding mills to the silos and from the silos to bulk loading stations, used water-jacketed pipelines.

At least one company tried injecting air into bulk cement cars and spraying the outside of the cars with water, but had little success. This same company installed an air separator for finish grinding of cement expressly for the purpose of using the cooling action of an air separator to get a cooler product. Previously air separation was used in this mill only in the manufacture of high early strength cement. It was the means of dropping temperatures sufficient to avoid rejection without tying up too much silo storage, along with a 10 deg. temperature drop obtained by pumping into bulk cement cars. The separator was instrumental in cooling a big volume of cement in a short time.

This plant had as much as 150,000 bbl. in 18 silos under test for the Turnpike at one time and by packing Turnpike cement from three separate packhouses during the early morning and after quitting hours at night was able to pack 11,000 bbl. of Turnpike cement a day without interference with other cement being shipped. New bulk loading spouts were added to speed up the draw-offs from silos.

This same mill, and many others, cooled some cement by transferring cement between silos. Use of a screw conveyor-bucket elevator system of transferring was effective in reducing temperatures as much as 50-80 deg. F., where 80-ft. high silos were used. In a few instances, where old-fashioned open shed storage is still used, cement was cooled much more than when handled into and stored in silos.

Ready Mixed Concrete

Ready-mixed concrete was used for construction of some of the smaller structures such as head walls and small bridges where its use was considered advantageous. Some of the operators of transit mixing and control mixing plant equipment set up batch transfer plants along the highway to shorten the haul. The average maximum length of haul with transit mixing was about ten miles. In furnishing transit-mixed concrete, operators were required to have the necessary devices on these trucks to verify the number of revolutions of the mixer and the quantity of water added. All equipment and materials were used subject to approval. Some equipment was not approved because of inaccurate water measuring devices and new mixer trucks were added by a few concerns.

Open Crushing Plant

JOHN ARBORIO, INC., Poughkeepsie, N. Y., has opened up a new quarry near Goshen, N. Y. While the plant was constructed primarily to supply crushed trap rock for this company's grade crossing elimination contract involving Routes 17 and U. S. 6, it is planned to make it a commercial plant. Diesel engines supply power for the crushers and other equipment. Another crushing plant is operated by this company at Pleasant Valley, N. Y.

OREGON LIME PRODUCTS CO. quarry and plant near Falls City, Ore., have been sold to T. T. Leonard. Roy Baker, manager prior to the sale, has been retained in charge of the plant.

Fitting Plants For Increased Production

Speed up all operations and add new equipmnt to increase capacity and quality of product

Trainload of quarry cars ready to dump at primary crusher, New Enterprise Stone & Lime Co.

CRUSHED STONE plants that were modernized, enlarged or rebuilt in connection with furnishing crushed stone for the Pennsylvania Turnpike were all of comparatively small capacity. The following pages are concerned with these improvements and compare the plants as they are now with how they were operated before the Pennsylvania Turnpike came along.

NEW ENTERPRISE STONE AND LIME CO., New Enterprise, Penn., operating plants at Ashcom, Everett, Roaring Spring and Waterside, had the largest single order for crushed stone. All the stone produced by this company, comprising 325,000 tons of 3A and 2B paving stone and 30,000 tons of tunnel stone (minus 2 in), was produced at the Ashcom plant which is located on the Turnpike. This plant is on one side of the highway and the quarry on the other and an underpass had to be built to get stone into the plant.

Capacity of the plant was stepped up from 75 tons to 100 tons per hour and a stockpile of 150,000 tons was built up in advance of the construction season. Inventories when the project was completed showed that the stockpiles of screenings had been built up from 11,000 tons to 37,000 tons, much of which is now being ground into agricultural limestone.

During peak periods, the plant operated 24 hours a day on two shifts and produced as much as 1600 to 1800 tons of Turnpike stone. Even with this high production rate, large stockpiles were very important when one considers that as much as 5000 to 6000 tons of stone were shipped out of the plant per day to keep as many as five and even seven contractors supplied with stone.

Preliminary to beginning production, some 75,000 tons of overburden were removed, using a Caterpillar D-8 model tractor and 12-cu. yd. LeTourneau Carryall to do most of the job. A complete checkup was made of the equipment in the plant, new machinery was installed, and particular attention was paid to the various drives on the older equipment, since many of the old style gear drives were in need of replacement. Nearly all the drives were replaced with Gates V-belting and V-belts were used wherever possible on the new machinery. Some of the important drives on heavy equipment consist of V-belt with flat pulleys on the driven pulley so that slippage could take place before the belting would tear up in event of jamming the equipment.

This plant formerly had only a No. 8 Austin gyratory crusher, a 4- x 18-ft. Austin revolving scalping screen, an 18- x 36-in. McLanahan and Stone Corp. jaw crusher and a 3- x 8-ft. double-deck vibrating screen, so it is quite evident that extensive machinery investment was needed. Normally this plant had produced only 50,000 to 60,000 tons of crushed stone annually. Production in the quarry had to be geared up as well. But it was all done, and the company took care of all its normal demands and kept its three lime kilns going as well for the duration of the Turnpike construction.

Loading stone into truck with shovel in the New Enterprise Stone & Lime Co. quarry. Note 45 deg. tilt to rock formation which is drilled with wagon drills

Speeding Up Quarry Operations

The quarry has a 140-ft. face and it consists principally of a dense blue magnesium limestone with some high calcium limestone that is quarried and handled separately for the manufacture of lime. All stone had been handled in the quarry by industrial cars and trackage, using a 1-cu. yd.

Above: Close-up of feeder regulating flow of material into primary crusher, Binkley Bros. & Ober. Below: Log washer on right, below; and roll crusher left with elevator leading to dry screening plant

Bucyrus-Erie steam shovel to load the cars. The industrial haulage system was discarded within the quarry itself and the trackage was torn out in favor of truck haulage, the old system being entirely too inflexible and slow for anticipated tonnages.

In its place, four trucks were substituted which hauled the stone to a dispatching station outside the quarry proper where a transfer was made into cars for delivery by locomotive under the Turnpike to the crushing plant over 36-in. gauge track.

Drilling and blasting as well as excavating capacity were stepped up also. Two new ¾-cu. yd. Northwest gasoline shovels were purchased and the three shovels were kept busy during operating peaks. One of the new shovels was also used at times to load stone into trucks from the stockpiles. Shovel sizes could have been larger but were selected to fit the company's future needs. A Northwest pull shovel attachment was used in stripping to dig down into pockets where the level of the rock ledge was irregular on top.

One well drill was formerly used to do all the drilling. A second Bucyrus-Erie well drill and a new Ingersoll-Rand wagon drill were added. A 2-stage, 350 c.f.m. Ingersoll-Rand air compressor was installed to take care of the greater drilling capacity. The ledge of rock is tilted in some sections of the quarry and stands at a 45 deg. angle. The wagon drill is equipped with a hoist to locate and hold it in position to drill 2½-in. blast holes on the slope.

Well drill holes are 6 in. in diameter. Size of the shots set off were not increased but they were made more frequently, bringing down an average of 30,000 tons to a well drill shot every six weeks. About 85 percent of all secondary breakage was done using a 3800 lb. Frog, Switch and Manufacturing Co. manganese steel ball dropped a distance of 25 ft. from the end of a 35-ft. crane boom to break the stone.

End dump quarry trucks hauled stone from the shovels outside the working level in the quarry to a ramp for transfer into Easton side-dump railway cars of 3-ton capacity. Trains were stepped up from five to six cars to be hauled by a Vulcan 4-ton gasoline locomotive under the Pennsylvania Turnpike and up over an elevated ramp where the cars are tilted by an air hoist to dump into the primary crusher.

Sidings and switches were so arranged that a train was pushed rather than pulled, whether loaded or unloaded, to eliminate delays. Returning with the empties, the locomotive passed beyond the transfer station and pulled the train of empty cars up behind the next trainload which had already been loaded. Upon engaging with the train of full cars, the locomotive spotted the empties, which were then disconnected and left at the transfer point while the other train of loaded cars proceeded to the plant.

Crushing and Screening

Additional crushing and screening equipment had been installed in the plant and a washing plant, independ-

Left: Locomotive (center) has drawn up empty quarry cars to be loaded from trucks and will push loaded cars to crushing plant, New Enterprise Stone & Lime Co. Center: Tunnel below highway connects quarry with the plant. Right: Snake-hole drilling. Hoist on left places wagon drill on 45 deg. tilted rock

ent but connected to the dry screening plant, was built.

The No. 8 primary gyratory crusher was equipped with a smaller crushing head, with a greater throw, set to produce a maximum size of 6- to 7-in. stone when furnishing Turnpike stone. Formerly reduction through this crusher was 5-in. top size. This was done for greater capacity, since more re-crushing capacity was installed, and since a preponderance of large stone was desired with a minimum of screenings in producing 3A and 2B Turnpike stone.

The primary crusher discharges on to a belt conveyor which feeds into the revolving scalping screen. Overs, plus approximately a 3½-in. sq. opening screen, were the feed into the previously-mentioned jaw crusher, which fed out to a conveyor feeding a new 4- x 12-ft., 3-deck Telsmith Pulsator vibrating screen.

Overs (2½- to 3½-in.) from this screen were put through a 3-ft. Telsmith cone crusher and then screened again, screenings (minus No. 4) went into a bin and the No. 4 to 2½-in. product was sent over a belt conveyor to the washing plant. Stone crushed through the cone crusher was elevated by a Blue Ball Machinery Works bucket elevator for passage over either of two 3- x 10-ft., 3-deck Telsmith Pulsator vibrating screens.

Left to right: Primary crushing unit, dry plant, and washing plant, Binkley Bros. & Ober, Dry Run, Penn.

New washing plant of Chambersburg Stone Co., Chambersburg, Penn.

Having two screens here was not a matter only for capacity so much as it was for flexibility to enable the production of tunnel stone and commercial stone for other purposes simultaneously with making 3A and 2B paving stone. Dry dust and unwashed stone from these screens were placed directly into bins.

Washing Stone to Remove Clay

Stone in the No. 4 to 2½-in. size range which was washed would naturally contain practically all the clay and other foreign matter and represented about 65 percent of the output of Turnpike stone. Washing was done in a new 12-in. x 30-ft. heavy-duty McLanahan and Stone Corp. twin log washer driven by a 75-hp. motor. After washing, the stone was screened wet over a 4- x 10-ft. Telsmith 2-deck Pulsator vibrating screen using ½- and 1⅛-in. cloth to produce 3A and 2B. Unwashed stone was subjected first to a blast of compressed air and then sprayed with water upon discharge into trucks to bring its moisture content up to that of the washed stone, and also to reduce dust.

Washing and scrubbing were considered necessary in order to insure meeting the quality requirements as measured by a maximum loss by wash of ½ of 1 percent and in order to be able to operate at all under inclement weather conditions. As it worked out, it was unnecessary to be overly thorough in removing overburden in the quarry since, by washing, as much as 50 percent clay was handled at times without rejection. About 500 g.p.m. of water were required for the washing plant.

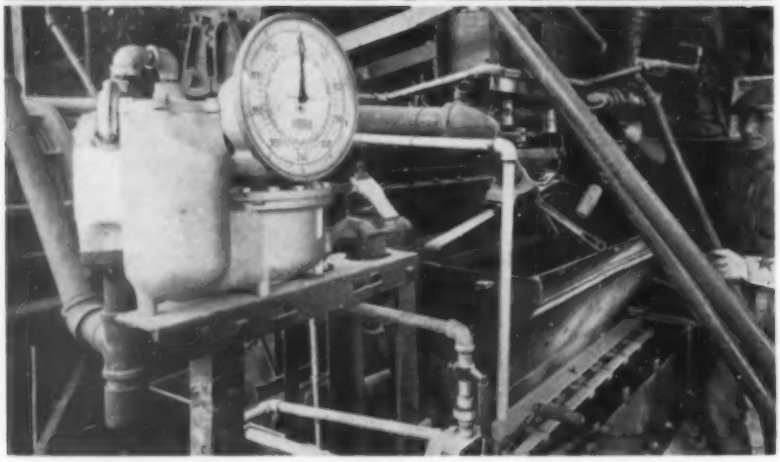
In anticipation of operating under conditions not too ideal, the washing plant was weather-boarded and salamanders were kept below the screens to release heat up through the screens to prevent freezing. During unseasonable weather conditions, when the plant was shut down, equipment in the dry end of the plant was started up occasionally to keep the grease from solidifying. Equipment in the wet end of the plant, when shut down occasionally over a Sunday, was turned over every 30 minutes or so.

About 10 trucks were kept busy removing stone from the bins to stockpiles where a bull-dozer attachment was used on the Caterpillar tractor to spread and maintain proper stockpiles. As many as 150 trucks were operating out of this plant in one day hauling finished stone so it was necessary to have modern, high-speed loading equipment. A new Barber-Greene portable loader, having 18-in. buckets, and one of the new shovels handled most of the loading.

Batching Equipment to Serve Contractors

Batching equipment was also purchased by the company to batch out aggregates and to charge transit mix trucks for the convenience of the contractor. This equipment included two 300-bbl. Butler bulk cement batching plants and two 105 ton 3-compartment Blaw-Knox aggregates batching plants. One of these aggregates batching plants has two sets of batching scales to speed up operations.

Being located at the end of the line on the Pennsylvania railroad, sand was unloaded and as much as 20,000 tons maintained for batching and direct delivery to the contractors. The aggregates batching plants were located against a bank so that trucks could dump aggregates directly into them; and they were equipped with steam jets, and even for the heating of mixing water for cold weather operation of transit mix trucks. Probably 70,000 tons of crushed stone were



Above: New dryer for bituminous road mix plant, New Enterprise Stone & Lime Co., Roaring Spring, Penn. Below: Batch control floor in road mix plant

delivered on the job in batching trucks from this plant.

Much of the screenings is being ground into agricultural limestone through a 4- x 8-ft. Kennedy air-swept ball mill driven by flat belt from a motor mounted on an American Pulley Co. flexible base.

Plant Equipped for Asphalt Mixes

At Roaring Spring, Penn., where the company operates a smaller crushing plant, a hot mix bituminous plant was installed and several thousand tons of asphaltic stone were furnished for miscellaneous construction, such as ramps, on the Pennsylvania Turnpike. Stone so treated had a size range of ¼- to 2-in.

This bituminous plant is a gravity operation, the stone charging equipment being located on the quarry floor level and batching equipment on a lower level.

Stone is trucked from bins or stockpiles and dumped into a hopper from which a Link-Belt bucket elevator puts it into a rotary dryer. This dryer is of a new design by the Lancaster Iron Works and is center-fired rather than end-fired, by oil. It is 30 ft. in length and 54 in. in diameter with a No. 23 Clarage fan at the feed end which draws the necessary air through the dryer to cool the stone and remove dust through a stack. The drive for the dryer is a 20-hp. motor and for the fan a 15-hp. motor.

By having the flame introduced at the mid-point one-half of the dryer's length is effective in developing heat to dry the stone while the other half, by the use of large volumes of air, in effect operates as a cooler. Capacity of the dryer is 35 tons per hour with a discharge temperature of 90-110 deg. F., 110 deg. F. being the maximum temperature allowed at the time of application of the bitumen. An adjustable gate at the point of discharge of stone into the elevator feeding the dryer is the means of control.

Discharge is over a 3- x 8-ft., 2-deck Telsmith Pulsator vibrating screen, sized stone dropping into a 3-compartment, 100-ton steel bin also manufactured by the Lancaster Iron Works. Weighing of the liquid asphalt and the aggregates is done by Fairbanks and Howe scales and mixing is accomplished in a twin pug mill manufactured by the New York Central Iron Works. The mixer is driven through Gates V-belt connected to a 75-hp. motor. Naphtha liquefier is measured into the mixer by a Neptune meter.

J. S. Detwiler is president of the New Enterprise Stone and Lime Co. and Paul I. Detwiler is secretary-treasurer. Dale W. Detwiler is superintendent of the Roaring Spring plant, and Galen and Emmert Detwiler are in charge of production at Ashcom.

SHIPPENSBURG STONE CO., Shippensburg, Penn., produced about 200,000 tons of crushed stone for the Pennsylvania Turnpike and operated as much as 20 hours a day, with continuous operation on an 11-hr. day during the 1940 construction season. Shipments out of the plant were as high as 1887 tons in a single day, of which 1000 tons was the production for that day. As much as 80,000 tons was carried in stockpiles at one time and stripping of 0-3 ft. of overburden was done well in advance of the job. This plant did not wash any stone because it had a clean ledge of blue limestock rock to work from and carefully removed all overburden.

The plant was built four years ago and had a normal capacity of 40 tons per hour in producing smaller sizes of stone than were required for Turnpike paving. Equipment consisted of a 13- x 30-in. primary jaw crusher, a No. 6 Allis-Chalmers McCully crusher for reduction, a 4- x 24-ft. revolving screen and a small vibrating screen. Power was furnished by two 110-hp., 2-cycle Cooper Bessemer Diesel engines. All this equipment, with the exception of the primary crusher was retained when the plant was enlarged to produce 100 to 125 tons of Turnpike stone per hour. Screens and elevating equipment had enough over capacity to handle the heavier tonnages required.

Stepping Up Capacity

In preparing for a greater volume of business, conveyors were equipped with new belting and all drives and accessory equipment given a thorough going over. Capacity of the plant itself was increased by replacing the primary crusher with a 24- x 36-in. Farrel Bacon jaw crusher and by installation of a second revolving screen and a No. 6 Kennedy gyratory crusher for reduction.

Primary crushing is a much more efficient operation than it had been. The crushing unit was built with a ramp for dumping stone from trucks on to a new 36-in. wide Telsmith apron feeder by which the feed into the crusher is regulated and kept continuous. A new 110-hp. Cooper Bessemer Diesel engine drives the crusher through a Gilmer Cable Cord flat belt. A Sturtevant gas engine

cooler is used to cool the Diesel engine cooling water.

Stone sizes for the Turnpike were generally larger than those produced before. Stone fed into the new crusher was of larger size and the initial break was to a size not as small as before. Stone discharged from the primary crusher went over a 30-in. conveyor belt, 86-ft. centers, into a 5- x 24-ft. Allis-Chalmers revolving scalping screen where screenings dropped into a bin. About 30 percent of the Turnpike stone was sized here into a bin. Oversize was fed into the Kennedy crusher and elevated to the finishing screen over the bins. This crusher is mounted in the place of the displaced primary crusher and the same bucket elevator is used. Further reduction was accomplished by pulling stone out from either of the plant bins into the McCully crusher which had been set up close for fine reduction and elevating this material to the screening plant. Finer stone sizes, such as chips, are graded over a Tyler-Niagara double-deck vibrating screen.

About 90 percent of the stone taken out of the quarry since it was opened was processed for the Turnpike and a nice face 65 ft. in height and 300 ft. long has been developed. Two well drills were in operation and the size of shots was increased from about 12,000 tons up to as much as 44,000 tons maximum. A ¾-cu. yd. shovel was replaced by a 1½-cu. yd. Marion steam shovel, and a Koehring Dumptor and a truck hauled the stone to the crusher. From 7½ to 8 tons were handled by the Dumptor and 4½ to 5 by the truck.

Some changes were made in the setup for power including installation of a Westinghouse 75 kw. generator to be driven by one of the Diesel engines to develop electrical power to drive conveyors, screens and other small equipment in the plant.

On the left is a new shovel operating in quarry of John A. McNeil Co., Jennerstown, Penn. To the right is a crane which drops steel ball to break larger rock

A ¾-cu. yd. Marion steam shovel, a ½-cu. yd. Insley and a ⅜-cu. yd. Universal shovel were kept available to load out stone from stock. After the project was finished, this plant had left on hand a 30,000 ton stockpile of screenings.

CHAMBERSBURG STONE CO., Chambersburg, Penn., which furnished some 50,000 tons of crushed limestone, was equipped with washing equipment. An 8-in. x 30-ft. McLanahan and Stone Corp. twin log washer driven by a 60-hp. motor and a 3- x 10-ft. 3-deck Telsmith vibrating screen comprise the washing plant, feed coming from any of the plant bins into the washer by belt conveyor.

Any size of stone, or combination of sizes, could be put into the washer, and the discharge of stone was sized over the screen and put into bins of 200-ton capacity. Pumping equipment was installed to deliver 300 g.p.m. into the washer. Some 25,000 tons of "contaminated" rock set aside over a period of years as unfit for grade A construction work was processed through the washing plant to pass the rigid specifications.

BINKLEY BROS. AND OBER, East Petersburg, Penn., built a completely new plant at Dry Run, Penn., and furnished close to 100,000 tons of Turnpike stone. A new plant had been contemplated previously but the new one was built larger than originally planned. The old plant had only a capacity for 20 to 30 tons per hour and was not equipped for washing while the new one was equipped to produce about 700 tons in 10 hours.

Overburden up to 8-ft. thickness had to be removed and three shovels of ¾-cu. yd. and 1-cu. yd. capacities did the excavating.

Loads of about five tons of stone were hauled in trucks to the primary crushing unit which consists of a 22- x 36-in. Good Roads Machinery Corp. Champion jaw crusher which is fed by a 4- x 7-ft. Telsmith apron feeder. The old plant had a 14- x 28-in. primary jaw crusher. A 30-in. belt, 86-ft. centers, conveys stone from the crusher to a 42-in. x 12-ft.

Shovel loading stone into special hauling unit with a capacity of 7½ to 8 tons, Shippensburg Stone Co.

Hauling unit dumping into apron feeder which feeds new jaw crusher, Shippensburg Stone Co.

General view of crushing and screening plant of John A. McNeil

revolving scalping screen. Stopping and starting of the crusher and feeder are controlled at the crusher by push button.

Oversize from the scalping screen is re-crushed through a 10- x 40-in. Good Roads Champion jaw crusher and is elevated by a 50-ft. Blue Ball Machine Works bucket elevator for dry screening over a 3- x 7-ft., 3-deck Telsmith Pulsator vibrating screen. A separation was made on the scalping screen to divert the proper sizes of stone for Turnpike construction into the washing plant.

Overs from the vibrating screen are reduced further by passage through New Holland corrugated rolls and re-elevated to the sizing screen. Ballast, agstone, and other products not requiring washing are sized over this screen and dropped into bins below.

The washing plant, which is independent of the dry screening plant except as a source of feed, consists of an 8-in. x 25-ft. McLanahan and Stone Corp. twin log washer mounted on the ground, an 80-ft. bucket elevator to a 3- x 7-ft., 3-deck Telsmith vibrating screen and a storage capacity of 400 tons in bins.

Diesel engines furnish all the power for the plant. One 150-hp. Buda-Lanova engine drives the crushers, V-belted to the primary and with flat belt to the other two. Another of 90 hp. drives the log washer and a third of 150-hp., all of the same make, drives a 100 kw. Westinghouse 220-volt, a-c. generator by V-belt to develop the electrical power to drive other equipment.

Binkley Bros. and Ober is a partnership of H. M. Binkley, C. R. Binkley and Harry Ober, operating other plants in Pennsylvania at East Petersburg, Lititz and Three Springs.

JOHN A. MCNEIL, Pittsburgh, Penn., operating a quarry near Jennerstown, Penn., produced between 75,000 and 100,000 tons of crushed stone at the rate of 90 to 100 tons per hour. The quarry was taken over by John McNeil early in 1939 and the plant was rebuilt to increase its capacity.

Drilling is done by wagon drill and two new Marion Diesel shovels, ¾- and 1½-cu. yd., excavate the stone, using truck haulage to the crushing plant. Much of the secondary breakage is done by a 3500 lb. steel ball dropped from the end of a crane boom.

Primary crushing is done through a 20- x 36-in. Iowa Manufacturing Co. Cedarapids jaw crusher equipped with a 36-in. Iowa pan feeder. The crusher discharge is elevated by two 24-in. Pioneer Engineering Works, Inc., belt conveyors to a 4- x 8-ft. Symons screen, conveyors being chosen as the means of getting necessary lift under limited conditions, to provide for a roll crusher added later.

From the scalper, plus 4-in. stone is put through a 15- x 20-in. Austin-Western jaw crusher and then elevated to a 4- x 9-ft. triple-deck Symons screen. Oversize from this screen (plus 2 in.) is crushed down further through 18- x 30-in. Austin-Western crushing rolls and returned to the screen by the same elevator. Storage of finished product is in bins beneath the screen.

From the scalper, a 2- to 4-in. product was put through 24- x 40-in. Pioneer crushing rolls, the fines bypassed and the crushed material joining in a common bucket elevator which discharges over a 4- x 12-ft. double-deck Symons screen. Roll crushers were used to produce more 2B stone to balance the production of 3A. Sprays were provided for washing on the screens if necessary.

International Harvester Co. Diesel engines power this plant. One 100-hp. engine drives the primary jaw crusher and a bucket elevator; another drives the 24- x 40-in. rolls and belt conveyors; a third drives the 15- x 20-in. jaw crusher, 18- x 30-in. rolls and bucket elevator; and the fourth, a 40-hp. engine, drives a 40½ kv.a. Westinghouse electric generator for power supply for miscellaneous motors.

H. B. MELLOTT, McConnellsburg, Penn., stepped up production from 75 tons an hour to 135 tons when producing Turnpike stone and produced about 100,000 tons, carrying in stockpiles as much as 40,000 tons of crushed stone. Here again, it was found necessary to shoot more blast holes (well drill) in the quarry to increase capacity, and a second shovel was added to speed up operations.

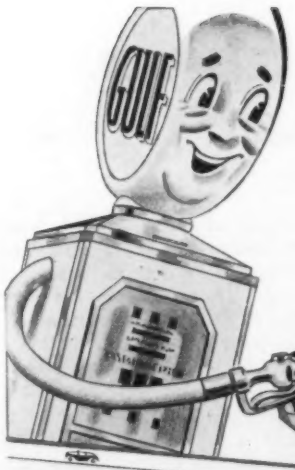
Primary crushing was done through the existing 36- x 48-in. jaw crusher, using a revolving screen for scalping purposes and a 4- x 7-ft. Telsmith heavy-duty feeder. Oversize stone was recrushed through a Farrell Bacon crusher and a 9- x 36-in. Telsmith Wheeling jaw crusher. The load of oversize stone from the scalper was split to these crushers and returns from a 4- x 10-ft. triple-deck Telsmith pulsator vibrating sizing screen were put through one crusher and then re-elevated to this screen for final sizing. A new 32B Telsmith reduction crusher was put in to increase the output of finer sizes.

Stone in the size range for Turnpike stone containing clay and other foreign material was diverted from the scalping screen into the washing plant, which is new. Here it was scrubbed through an 8-in. x 30-ft. McLanahan and Stone Corp. log washer, then elevated and re-sized over a 3- x 8-ft., 3-deck, Telsmith Pulsator vibrating screen.

This plant, which generates its electrical power by steam engine, put in an additional engine and 75 kw. generator to supplement existing power and for standby service.

Turnpike Opening Again Delayed

OPENING of the Pennsylvania Turnpike, originally scheduled for Labor Day, has been postponed until sometime "before September 15" according to an official report. One reason given for the new delay was the expected difficulty in starting operation under pressure of accommodating the holiday crowd.



our hat is off

to the PENNSYLVANIA TURNPIKE CONTRACTORS

●For a great job well and *quickly* done, we salute the Pennsylvania Turnpike Contractors! They have shown the world what American engineering genius can do.

Gulf is proud to have participated in this achievement. The use of Gulf quality lubricants and fuels by most of the widely known construction companies on the Turnpike is evidence, we believe, that fine petroleum products are *essential to efficient operation* of the modern, high-speed equipment in use today.

In every industry, Gulf lubricants and engineering service are helping the men-on-the-job speed production and reduce costs. Are you working toward the attainment of greater operating efficiency? A Gulf engineer can help you. Ask him to recommend improved lubrication practice—you will not be obligated. The Gulf line of more than 400 oils and greases is quickly available to you through 1,100 warehouses in 30 states from Maine to New Mexico.

With the completion of the new Pennsylvania Turnpike—a 160 mile 4-lane super highway from Pittsburgh to Harrisburg, Pennsylvania—the crossing of the Allegheny Mountains is now made easy for motor cars and trucks. Seven tunnels level the road to a maximum grade of 3%. The above scenes show some of the modern equipment used on this great project.

GULF INDUSTRIAL LUBRICATION

Particle Size Distribution

Of Portland Cement and What It Means

By F. O. ANDEREGG, Ph.D.*

AFTER PORTLAND CEMENT has passed through the tube mill, where it has made innumerable contacts with other cement particles and with the grinding media, it has been ground so that the cement grains fit fairly well (pack) together. If any particular grains do stand out they tend to receive the impact of the balls and so are reduced. The question arises whether or not to trust this haphazard treatment of reducing from a given clinker a cement which will develop to the fullest, economically feasible extent the potentialities within the clinker.

The hydration reaction takes place at the surface of the cement grains so the strength developed will depend upon the surface exposed. Since Leslie performed his classic experiment on regrinding set cement, it has been realized that much of the cement never does hydrate. Should not more of this potentially active material be made available to strengthen our concrete? The amount of profitable additional grinding, such as might be obtained by simply leaving the cement longer in the tube mill, is limited. The coating of the media seriously limits output and all too frequently the product finally obtained gives disappointing results, especially in the way of excessive shrinkage in the resulting concrete.

The unground cement is not wasted by any means, for the unhydrated kernels have very definite functions to perform. They serve as the very best aggregate that can be obtained. Their contact with the hydrated cement gel is obviously far more intimate than can be expected from extraneous fine silica grains, for example. The unhydrated nuclei give a skeleton to the cement paste and key against the development of fracture planes. A proper balance between the amount of cement available for hydration and that left unhydrated is needed. Not only is the fineness of grinding important but also the size distribution of the cement particles that will give best results.

Among systems of broken solids, two especially have demonstrated excellent intergranular packing.[1] One

*Consulting Specialist on Building Materials, Newark, Ohio.

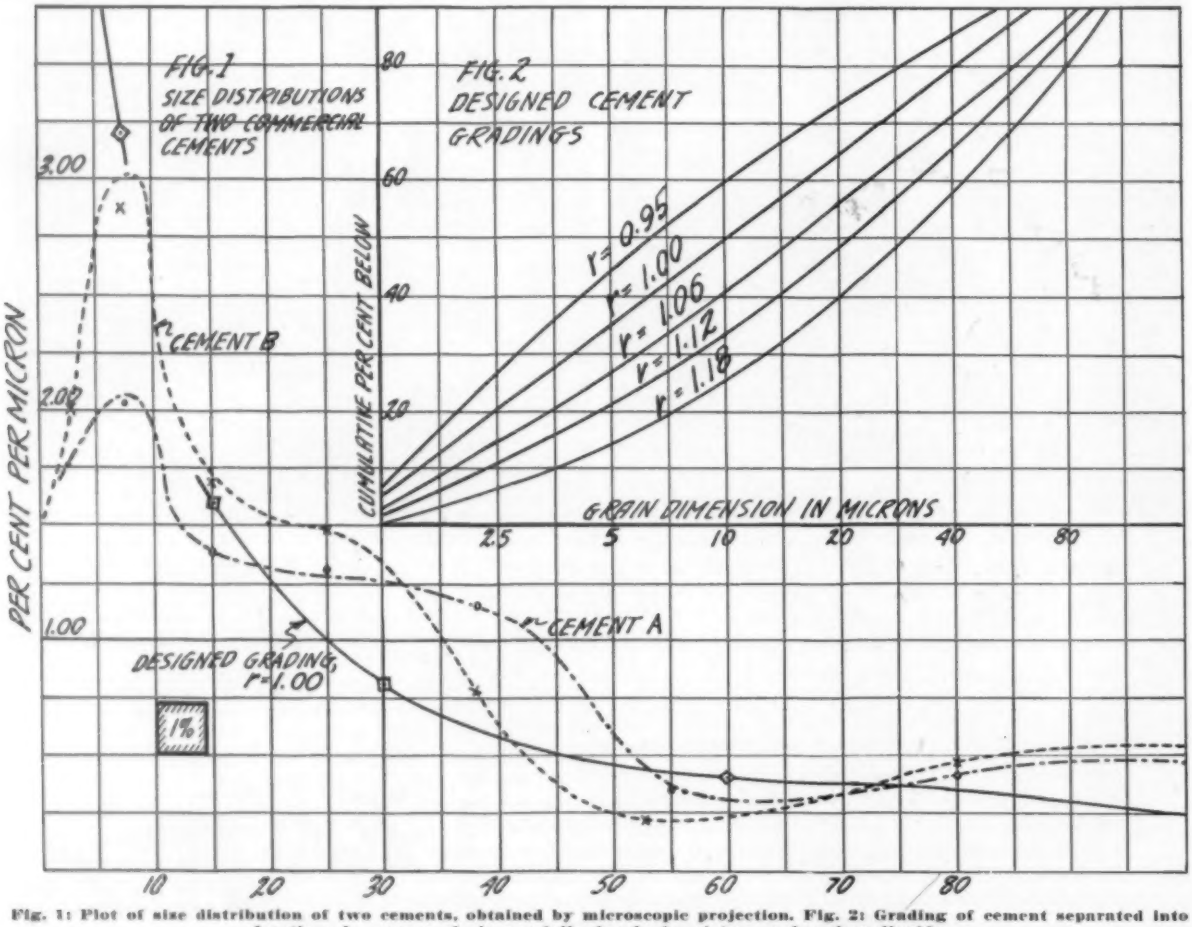


Fig. 1: Plot of size distribution of two cements, obtained by microscopic projection. Fig. 2: Grading of cement separated into fractions by means of air carefully freed of moisture and carbon dioxide

TABLE I.—PROPERTIES OF CEMENTS FROM ADJACENT PLANTS—CEMENT A GROUND WITH ⅞-IN. BALLS; CEMENT B WITH ¾-IN. BALLS

Cement	+200	Normal Consist.	Packing Ml./g.	Specific area cm²/g.	28-day Mortar Strengths, psi. Tensile Std. sand	Tensile Ohio R.	Compressive Std. Sand	Compressive Ohio R.
A	14.8	24.0%	0.490	1878	436	448	3839	3634
B	13.2	23.4%	0.496	1977	482	499	3992	3847

Cement	28-Day Concrete Strengths, psi. Avg. of 3 mixes, each at 2 slumps Each datum averaged from 18 cylinders	Strength ÷ Surface Area Mortar Tensile		Mortar Compressive		Concrete
A	2312	.232	.238	2.03	1.88	1.23
B	2510	.244	.253	2.02	1.94	1.27

Cement A, ground with ⅞-in. balls. Cement B, ground with ¾-in. balls.

system has gaps in its grading, but the packing is probably the best that can be obtained, although it requires special methods of placing to get each grain in its proper position. The other system of grading has all the sizes of grains present in a definite sequence. It not only gives quite good packing, but affords a system of very excellent workability so that for most purposes it is much more useful than a gap grading. The explanation of the superior workability lies in the "ball bearing" action of the finer particles.

For rounded sand grains it has been found[1] that a constant ratio of 1.2, when separated by standard sieves gives best results. Each fraction of sand grains should be about 20 per cent larger than the next smaller fraction, which would have an average grain dimension one-half as great. For concrete, with its greater range of sizes, adequate workability seems to be obtained if the ratio, especially among coarser particles, is raised to 1.4. For portland cement, a ratio of 1.00 has been proposed,[2] which means logarithmic grading.

Among commercial sands, comparatively few can be found approaching a uniform grading, and it has been definitely shown that too much in any one fraction "interferes" with the proper packing and functioning of the whole.[3] The writer has likewise found that most commercial cements possess "humps" in their grading curves, which tend to interfere with their proper packing.

For instance, two cements, whose size distribution in percent per micron, obtained by microscopic projection, are plotted in Fig. 1, have received some study, and the results obtained are given in Table I. These cements came from adjacent mills, working on similar raw materials.

The two cements checked in chemical analysis within the error of the determination, while the petrographic methods available failed to demonstrate any distinction. The only difference seemed to lie in the grinding. Cement A was ground with larger balls than cement B.

Cement B had more "flour" material below 20 microns than cement A. Both, however, had humps in the grading curve, as shown in Fig. 1. That of cement A occurred at 30 to 40 microns, while cement B had one at 20 to 30 microns. In spite of the greater amount of flour in cement B, its water requirement to produce normal consistency was slightly less than that required for cement A. Apparently the larger hump of the latter has interfered more with the packing of the cement grains. The values obtained by tapping a graduated cylinder containing cement until no more subsidence occurred, confirmed this conclusion. Coincident with the smaller hump of cement B, appreciably better workability was evident in laboratory manipulation and had been noted by engineers in making comparative field tests.

CHEMISTS' CORNER

Problems and practices of the chemists in the industry are discussed on these pages. Contributions and comments are invited.

The 28-day strengths of cement B generally were higher than those of cement A, whether obtained with mortar specimens fabricated from standard Ottawa or from Ohio River sand, or secured with concrete specimens of Ohio River aggregates. The latter data were each averaged from 18 specimens, including 3 cylinders each of three mixes at two consistencies. Since the differences were quite consistent throughout the series, they may be adequately summarized by these averages. The strength-surface area ratio is usually slightly higher for cement B than for cement A in line with the water requirements.

Some measurements were made of volume and weight changes on wetting and drying neat specimens fabricated from these two cements. It was found that at low water-cement ratios cement B performed slightly better than cement A, absorbing less water and undergoing smaller volume changes. At high water-cement ratios, however, any distinctions were concealed by the effect of the extra

TABLE 2. SOME PROPERTIES OF GRADED CEMENT

Grading r=	Cement substituted Percent	Water reqd. Percent	Compressive 28 days	Dry cement pct.	Hydrated 28 days Percent	Strength Area	Comp. Str. Hydrated[2]
			CEMENT ONLY				
1.00	00	14.1	4532	91.4	81	1.99	6960
1.06	00	13.8	4152	88.2	76	2.01	7130
1.11	00	13.2	3220	85.6	73	1.81	6105
1.18	00	13.1	2910	109.5	67	2.05	6470
			HALF OF COARSE CEMENT REPLACED BY SILICA (above 20 microns)				
1.00	9	14.1	4105	81.3	78	1.63	6750
1.06	14	13.1	4155	86.1	72	2.10	8040
1.11	19	12.9	2490	92.3	67	1.59	6155
1.18	23	13.6	2275	101.7	61	1.75	6110
			ALL OF COARSE CEMENT REPLACED BY SILICA				
1.00	18	13.1	3613	80.2	75	1.47	5940
1.06	28	13.1	3200	86.7	67	1.70	6170
1.11	37	13.3	2530	94.0	61	1.80	6860
1.18	45	13.2	2030	95.4	55	1.72	6840
					Average	1.79 ± .18	6900 ± 740

EFFECT OF MOISTURE CHANGE UPON LENGTH AND WEIGHT OF 1:3 MORTAR SPECIMENS, PERCENT

Grading r =	No replacement of cement Length	Weight	Half of coarse cement Replaced by silica Length	Weight	All of coarse cement Replaced by silica Length	Weight
1.00	0.027	1.66	0.037	1.88	0.036	2.00
[illegible]	[illegible]	[illegible]	.045	2.20	0.39	2.64
1.11	.034	2.41	.043	2.65	.033	2.75
1.18	.043	2.61	.058	2.80	.034	3.25

water. These experimental results seemed to indicate the deleterious effect of humps in the grading curve, similar to the experience with sands.[1] So it seemed desirable to make up some synthetic gradings of cement, all to be free of humps.

Synthetic Cement Gradings

Owing to the great irregularity of the finest particles and also to the reduction in volume of the kernels through hydration, it seemed logical to try ratios between successive fractions somewhat smaller than had given best results with sand.[2] Air elutriators of several sizes were built and cement was separated into fractions by means of air carefully freed of moisture and carbon dioxide. A sufficient amount of material was obtained to make up the gradings shown in Fig. 2, with ratios between successive fractions varying from 0.95 to 1.18. The first of these, because of excessive water requirement and resultant high shrinkage, was soon eliminated from the series.

Since the amount of material was limited, microtesting was in order. Strength tests were made on 1 in. cubes using a mechanical tamping device capable of yielding somewhat more constant results than by hand tamping. The effect of moisture on volume and weight was determined with ½ x ½ x 3 in. specimens having brass inserts. The length was read to 0.0001 in. consistently. Two cycles were run of 6 days drying and 24 hours soaking. Previous extensive experiments had indicated that two cycles were adequate for comparative results.

To obtain information on the possibility of replacing the part of the relatively expensive cement clinker serving as aggregate by cheaper materials, two series of specimens were made up. In one, half of the coarser cement was replaced with silica grains of the same grading, while in the other, silica only was used above 20 microns. The aggregate was silica graded from 200 mesh to 8 mesh, each successive larger fraction being 1.2 times greater ($r = 1.20$), than the next smaller. The whole mix was brought to as near normal consistency as could be judged by direct comparison with the consistency of mixes of the original cement with standard Ottawa Sand. The results are given in Table II.

The first grading, $r = 1.00$, contained 50 percent flour and its compressive strengths may be compared with that obtained from cubes made from cement wholly below 20 microns, which was 5890 psi. at 28 days. The other three gradings contained 42, 33, and 25 percent below 20 microns, respectively.

These results indicate that the first grading, with equal fractions in the ranges—2.5 to 5, 5 to 10, 10 to 20, 20 to 40, 40 to 80 microns—gives the highest strength, the densest mortar and the lowest volume change. This last property is of great importance and indicates that much of the shrinkage troubles that have been experienced with many commercially, very finely ground cements, is to be traced to the humps in the grading, which also cause increases in the water requirement and reductions in workability. The cement of logarithmic grading ($r = 1.00$) gave oustanding workability; it had a considerable degree of the property known as "plasticity," as well as of water retaining capacity. Those two properties are related to the greater surface area, in conjunction with the absence of humps, which would interfere with proper packing. It is suggested that the chief factor in cement bleeding is probably poor packing, due to humps.

The data in the next to the last column of the upper part of Table II seem to indicate that the compressive strength is proportional to the specific surface of the cement, while those in the last column show a similar relationship with the square of the amount of cement hydrated,[4] as calculated from the known rate of hydration for this cement.[5] The reason for this coincidence depends upon the complete hydration of the cement below 15 microns at 28 days and upon having a size distribution which happens to bring out these relationships.

Another important conclusion that may be drawn is that portland cement in the coarser sizes makes an excellent aggregate, appreciably better than silica. These experiments indicated that grinding the coarser clinker particles finer should give an all-around better performance per unit cost. The present day finer grinding of portland cement is in line with this conclusion; but until some way of controlling humps is worked out, completely rational grinding of cement cannot be secured.

References

[1] F. O. Anderegg, "Grading Aggregates," Ind. Eng. Chem. (1931) 23, No. 9, p. 1058.

[2] F. O. Anderegg, "Relationships in the Distribution of Particle Sizes in Cement." Zement, (1934) 23, p. 99.

[3] C. A. G. Weymouth, "Effects of Particle Interference on Mortars and Concrete." Rock Products, Feb. 25, 1933, p. 26. Am. Soc. Testing Mat. Proc. (1938) 38, II, p. 354; cf. discussion, ibid, p. 373-393.

[4] Werner and Giertz-Hedstrom, "The Strength of Portland Cement." Zement (1928) 17, 1002; (1931) 20, p. 984, 1000.

[5] Anderegg and Hubbell, "The Rate of Hydration of Portland Cement Clinker." Am. Soc. Testing Mat. Proc. (1929) 29, II, p. 572.

More Sand and Gravel Produced in 1939

ACCORDING to figures compiled by the Bureau of Mines, the total production of sand and gravel in the United States in 1939 increased 7 percent in quantity and 11 percent in value, with an output of 194,818,533 tons valued at $95,224,047 compared with 181,320,233 tons valued at $85,922,847 produced in 1938.

Sales reported by commercial producers amounted to 118,393,120 tons valued at $71,182,558 in 1939 compared with 105,759,786 tons valued at $65,015,878 produced in 1938, an increase of 12 percent in quantity and 9 percent in value. The average value was 60c a ton in 1939 and 61c a ton in 1938. Amounting to approximately 88 percent of the total commercial production, 103,771,791 tons were reported as washed or screened material with an average value of 64c per ton. The average value for unprepared sand and gravel was 31c a ton. About 45 percent of commercial production was shipped by truck, 40 percent by rail and 15 percent by waterway.

Heavy Shipments of Tennessee Phosphates

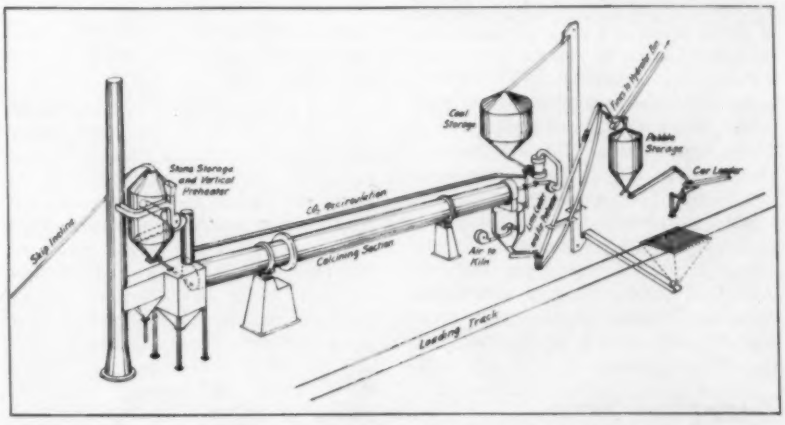
SHIPMENTS of phosphate rock to farmers for direct application of finely ground material began a little earlier than usual, the last week in July having witnessed shipments equal to any previous week in August-September period, the season of largest shipment. Illinois is reported to have taken 50,000 tons of phosphate in 1939, 27,000 tons by rail and the rest by truck.

The Middle Tennessee Technical Society was recently organized by operators and others interested in the phosphate and related industries with H. R. Mosely of T.V.A. as president and L. E. Grissom of Charleston Mining Co., Mt. Pleasant, as secretary-treasurer, with about 30 charter members.

Bulletin 48, dealing with The Phosphate Resources of Tennessee, is now available from the Division of Geology, Department of Conservation, Nashville, Tenn. This very complete volume of 444 pages by Richard W. Smith and Geo. I. Whitlatch contains maps and valuable test data covering all the known deposits.

IMPROVING HYDRATORS AND ROTARY KILNS

By VICTOR J. AZBE*



A futuristic design of rotary lime kiln preceded by a direct contact stone preheater

IN THE ILLUSTRATION may be seen a hydrator redesigned for continuous operation which was observed in a certain plant in Canada where it was used for many years producing a finishing hydrate.

What particularly appealed to the observer was the classifying feature in which the completely hydrated light particles float and overflow while the heavy would hug the bottom and outer periphery, directed thereto by the centrifugal force of the continuously rotating pan. The prehydration screw used in this plant and the idea that hydration should be controlled with the aid of a recording thermometer also seemed desirable. The illustration shows certain improvements that have been added to the original design, such as the arrangement to lower the discharge ring to skim off the hydrate, then raise it to empty the unhydrated material and pass it to waste without cluttering the system as a whole with it.

It is a double system with a mechanical separator and plain throw-out mill. It is felt that a system such as this may give the highest grade product, although over this question there may be quite a difference of opinion. The men required would depend, of course, on the capacity but for 40 to 50 tons capacity in one shift, four men in all would be needed.

The lime industry is groping for a solution of rotary kiln problems as well as the vertical kiln. There are rotary installations of every imaginable type; short and long kilns of small and large diameter, many of them inefficient both from an investment and an engineering standpoint.

LIME FORUM

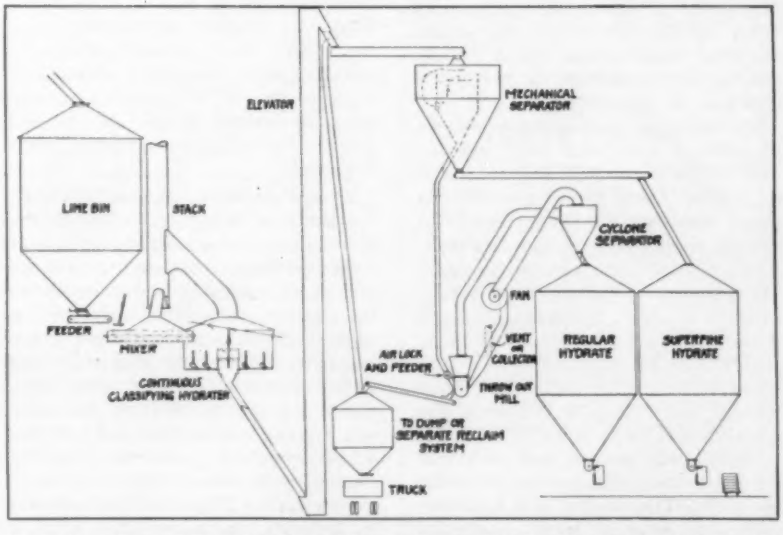
Mr. Azbe is a contributing and consulting editor of ROCK PRODUCTS. He will be glad to receive inquiries from his readers, and will answer these direct or through the columns of this Forum.

There are rotary kilns that burn part of the gases in the dust chamber which means that stone entering is preheated with heat that should have been making lime. There are other kilns, and altogether too many of them, that waste all of the sensible heat in the discharging lime. Kilns are also found in which a narrow strip of the product trickles down the bottom of the kiln which is expected to absorb heat in effective quantities from the large stream of gas rapidly passing above. A limited absorption surface is expected to perform effectively, not through the efficient means of heat transfer by direct contact but by the more difficult means of radiation.

In spite of those difficulties, the rotary has many advantages and is desirable in quite a number of plants, but it should be developed along sound lines for low first cost of installation and low operating cost.

As in the case of hydrators, we do not want to pose as experts but we have observed and tested many rotary kiln installations of all sorts, studied their good and bad points into great detail and contrasted performance of many types. Therefore, ideas have developed which we would like to convey to you completely unencumbered by any reservation of rights or patents.

The accompanying illustration shows the rotary plant of our dream. The rotary part is short, and is of flame length and of large absorption area. Here calcining proper is done.



Hydrating plant arranged to lower the discharge ring to skim off the hydrate and then raise it to empty the unhydrated material and pass it to waste

* From an illustrated paper presented before the recent National Lime Association convention in Chicago.

This section is preceded by a direct contact stone preheater. Enough experience is available with burning of spalls in vertical kilns and the passage of gases through high beds of great resistance to know that this unit need not be complicated and costly.

About the same applies to the lime cooler which also is self explanatory. There may be some difficulty through unequal flow but to make the hood rotate would be a simple matter.

With powdered coal, such an installation would be cheapest in cost and it could not be more efficient from fuel standpoint. It is only from such an installation that we need fear for the future of the vertical lime kiln of today.

Turnpike Sets New Standards

(Continued from page 36)

tracts and to stock sufficient material to insure satisfactory progress. The entire project required the placing of 4,300,000 sq. yd. of reinforced concrete paving and, when weather conditions permitted, the placing of an average of 2.5 miles of four-lane pavement every day.

Quarries Were Inventoried

Quarries and their equipment were inventoried and a study was made of the production records of each for an 8 hr. shift. Some were not approved for the job because of insufficient capacity and some were given partial approval if they would split their share with other producers.

Other quarry operators who were granted approval, had to go on two or three-shift operation and some were advised to install new equipment. Approval was not granted to some sources of stone where there was too much intermingling of shale or excessive overburden which would make clean stone difficult to produce in inclement weather. In some cases certain sections of a given quarry were approved as the source of stone. Two geologists and representatives of the Pennsylvania aggregates producers associations coöperated in this work of classifying stone and sand. Sites for new quarries were approved where advisable but extensive development work was discouraged if conditions were considered too difficult and expensive.

Producers were required to make test pits and to blast out rock for sampling for wear and soundness tests, all as a part of the preliminary work. Approval was given to some small producers, with daily capacities of 500 to 800 tons, to stockpile stone during unseasonal weather as a reserve up to 50 percent of the job requirements, and these producers were required to show proof that by so doing they could maintain required schedules. This was done in preference to putting in capacity that could not possibly be utilized when the job was completed.

This meant some winter operation for many producers who were unaccustomed to operating at that time of the year and the accumulation of large stockpiles in advance of the construction season. In a couple of instances, even in the larger plants at the ends of the highway, inclement weather made operation of quarry haulage equipment so difficult that the plant operators could barely operate. At least one operator hauled stone from an entirely different source to prevent bogging down of haulage equipment. Despite large volume requirements, some of the producers made necessary plant expansions and alterations to hold much of their regular business while producing Turnpike stone but in some plants attention was turned 100 percent to getting out stone for the Turnpike.

Some of the producers, while engaged 100 percent on the project, turned over regular commercial business to competitors and, in a few instances, plants not producing stone for the project did produce some to help a competitor keep up his output. As an example of competitor coöperation, we cite the case of sand production for the Turnpike in the Pittsburgh area. Probably one-third of all the sand used came from plants near Pittsburgh, which are members of the Pennsylvania Sand and Gravel Producers Association. During conditions of high water, which curtail the operations of dredging plants, and other factors preventing production, material requirements were divided among the producers to prevent a shortage of sand on the job.

To sum it up, commercial producers of crushed stone and sand got the bulk of the business at prices as high or higher than those received for other business. Prices for grade A paving stone were in the neighborhood of $1.25 per ton f.o.b. plant. Those plants located along the central section of the Turnpike had 20 months of production on a scale never experienced by them before and they made a profit. The contractors were mainly well financed concerns and payment was made to them during the winter months so that they could pay the producer of aggregates during the period when he was building up stockpiles that were as large as 150,000 tons. Needless to say, the project greatly stimulated employment, shipping, purchases of materials and the construction and manufacturing industries in the State.

One outside commercial producer, Concrete Material and Construction Co., Waterloo, Iowa, set up two temporary Diesel-powered Iowa Manufacturing Co. Cedarapids plants at locations where added production was considered necessary and one other concern built a temporary plant to produce crushed stone—all three of which have been dismantled.

One of the Cedarapids plants was stationed near Bedford, Penn., and produced about 130,000 tons. The quarry was leased from E. J. Kilcairn and Sons, operators of a small commercial stone plant. Power was furnished by Caterpillar and McCormick-Deering Diesel engines. The second plant, located at Spring Run, Penn., produced about 100,000 tons.

The third temporary plant was operated by L. B. Smith, Camp Hill, Penn. This plant was powered by Murphy Diesel engines and was largely Telsmith equipped. Principal equipment included a 16-B gyratory crusher, a No. 36 gyrasphere crusher, two 4- x 12-ft. 3-deck vibrating screens, a 3- x 8-ft. 2-deck vibrating screen and a 72-in. super-scrubber, all manufactured by Smith Engineering Works.

Tonnage requirements meant the need for the installation of equipment in local plants that was capable of standing up under the wear and tear of continuous 24 hour operation.

General Nature of Equipment Installations

Types of equipment that were installed will be discussed in their relation to the specifications and, in particular plants, later in this article. From the tonnage standpoint alone, there have been installed additional crushing and screening machinery, more equipment for excavating stone and for loading it into trucks and larger stockpiling areas have been provided.

At the extremes of the Turnpike, volume was fairly well divided between large well-equipped plants that were capable, with minor adjustments, of producing 50,000 to 100,000 tons of crushed stone each. In the central district, tonnages per plant ran from 100,000 to as high as 360,000 in one case. In the latter plant, 360,000 tons is just seven times the average annual production of this plant, which required considerable added equipment despite two-shift continuous operation. These installations will be discussed in more detail after a consideration of the specifications.

NATIONAL ASSOCIATION ACTIVITIES

Sand and Gravel

PRESIDENT PAUL BIRD has announced that the regular semi-annual meeting of the board of directors will be held at the Willard Hotel, Washington, D. C., on Thursday and Friday, October 10 and 11. The meeting will convene in the Cabinet Room of the hotel at 10 a.m., on October 10. As the next convention in Cincinnati will be the 25th annual meeting, appropriate program features for the silver anniversary will be considered.

AN ANALYSIS of Interpretative Bulletin No. 4 of the Wage and Hour Division has recently been sent out to members of the National Sand and Gravel Association by Executive Secretary Ahearn. This bulletin deals with the so-called "constant wage" plan under which a plan for the prepayment of wages may be followed making it possible for employes to receive a definite wage income during each pay period when hours of work during the period may vary from week to week. This may be applied over a bi-monthly or two-week pay period, for example. Important exceptions are made with respect to salaried employes where holidays, vacation, and sick leave time is ordinarily allowed.

Safety Congress

ANNOUNCEMENT has been made of the tentative program for the cement and quarry section of the National Safety Congress to be held in Chicago at the Stevens Hotel, October 9 and 10. On the first day, P. N. Bushnell, manager, safety and personnel department, Missouri Portland Cement Co., will give his report as chairman. This will be followed by the election of officers; a paper by A. J. R. Curtis, assistant general manager, Portland Cement Association on an Analysis of Cement and Quarry Industry Accident Experience, and a panel discussion on the physical control of accident hazards led by G. E. Warren, vice-president and manager, Southwestern Portland Cement Co., Osborn, Ohio, participants including: Fred B. Hunt, Dewey Portland Cement Co., T. W. Jones, New Haven Trap Rock Co., and J. J. Kelly, Marquette Cement Manufacturing Co.

On the following day, a feature of the program will be another panel discussion on Creating A Safe Working Force. R. B. Fortuin, Pennsylvania-Dixie Cement Corp., will be discussion leader with the following participants: Th. Avnsoe, Lone Star Cement Corp.; R. A. Bechtold, Pennsylvania-Dixie Cement Corp.; C. P. Harris, Huron Portland Cement Co., and L. P. Warner, Jr., Warner Co.

Lime

IN A RECENT BULLETIN to the National Lime Association, Secretary Brumbaugh outlined the provisions affecting shipment of quicklime in Proof No. 4 of the Proposed General Revision of I.C.C. Regulations for the Transportation of Explosives and Other Dangerous Articles by Rail, Motor Vehicle and Water. Under the new provisions even though quicklime is classified as a hazardous material it may be shipped by rail or highway in bulk in any suitable container, acceptable to the carrier. When quicklime is to be transported by water, or by a combination of rail and water or motor vehicle and water, it must be packed in metal drums, tight wooden barrels, asphalt-lined multiwall paper bags, asphaltic paper-lined jute or burlap bags, or wooden or fiber-board boxes, but as far as the I.C.C. regulations apply, no particular specifications for such containers are required. The lime, of course, must not be stowed until thoroughly cooled.

In commenting on reports of unsuccessful results in earlier attempts to use lime in the road stabilization process, Sherman D. Lesesne, a speaker at the recent convention, points out that the fault lay with the method of mixing the lime and clay. Lime and clay should only be mixed in a dry condition.

COMING CONVENTIONS

National Safety Congress, Stevens Hotel, Chicago, October 7-11.

National Sand and Gravel Association, Netherland Plaza Hotel, Cincinnati, January 15, 16 and 17.

National Crushed Stone Association, Netherland Plaza Hotel, Cincinnati, January 20, 21 and 22.

American Road Builders' Association, New York City, January 27, 28, 29 and 30.

Industrial Sand

CERTAIN OBJECTIONS to the New York Industrial Code, Rule 35, concerning dust control in the stone cutting and finishing industry were presented recently by Executive Secretary V. P. Ahearn of the National Industrial Sand Association. The first objection relates to Rule 35-2.3 which fixes three classifications of injurious dust concentration. These classifications differ from classifications in the other codes and it was urged that they be amended to conform with the others. The second objection pointed to the lack of a provision for approval of plans by the New York State Department of Labor. It was held that the Department should approve plans before installation of protective equipment and devices and that after approval, no changes should be required for a period of three to five years.

Ready Mixed Concrete

COMMENTING on Interpretative Bulletin No. 9 as revised by the Wage and Hour Division, dealing with Section 13 (b) (1), Secretary Ahearn of the National Ready Mixed Concrete Association points out that while this section exempts from the maximum-hour provisions of Section 7 "any employee with respect to whom the I.C.C. has power to establish qualifications for maximum hours of service pursuant to the provisions of Section 204 of the Motor Carrier Act, 1935," this exemption does not apply to the minimum wage provisions of Section 6, nor to any part of the Act except Section 7. The I.C.C. has postponed the effective date of the regulations concerning private motor carriers from August 1, to October 1, 1940, to give the commission an opportunity for reconsideration of the safety requirements for private motor carriers.

Pennsylvania Stone Producers Annual Outing

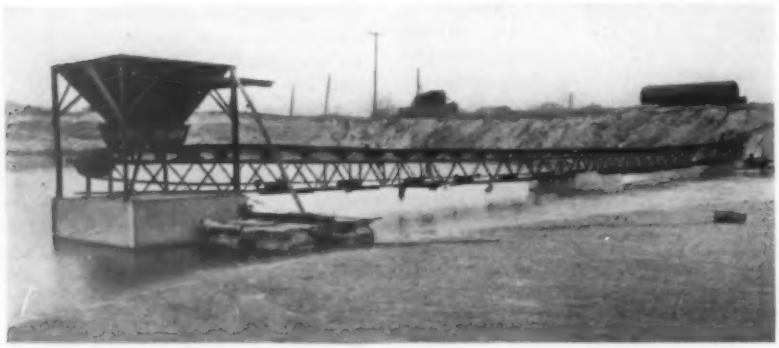
CRUSHED STONE PRODUCERS of Pennsylvania had another memorable outing at the Blue Ridge Country Club at Harrisburg, Penn., on August 14. This annual event of the Pennsylvania Stone Producers Association, Inc., held under the guidance of H. H. Wagner, general manager of the association, is one which always attracts an excellent attendance because there is some activity for everyone.

Hints and Helps

★ FOR SUPERINTENDENTS ★

Stripping Ahead of Hydraulic Excavating

AT JUNIATA, Mich., Andersen Sand and Gravel Co. operates a pontoon-supported belt conveyor to dispose of overburden ahead of its dredge excavation. The deposit is covered with



Belt conveyor and hopper on pontoons move overburden to worked out sections

6 in. to one foot of topsoil which is dumped back into worked out sections of the lake.

The conveyor is 110-ft. centers with a hopper to receive the overburden from a ¾-cu. yd. clamshell. Working ahead of the dredge operation, a bulldozer builds up windrows of top soil just back of the edge of the bank, by pushing some of the material from the edge and also further back toward the edge.

The conveyor is pulled into position by ropes, the hopper end butted into the bank and tied to the clamshell machine, and is then extended straight out so that the discharge end is over the worked out part of the lake. It's a simple matter to move and re-locate the conveyor as the clamshell follows the windrow.

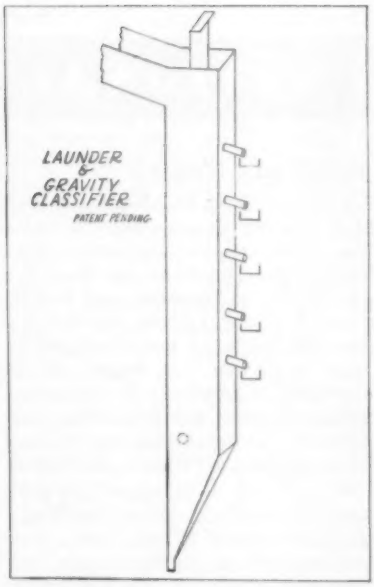
Suction Sluice for Classifying Sand

THE SCHMITZ VACUUM SUCTION SLUICE, a recent invention which was developed as mining equipment, may also be applied to the sand and gravel industry. It is claimed that by a new application of an old, well-known principle this apparatus makes it possible to produce any mesh classification in a simple, efficient manner.

As shown in the illustration, the sluice has a double bottom. In the upper floor is the classifier, consisting of a flat set of screens, the controlling factor being a classifying screen of monel, non-rusting metal. The lower compartment has a vacuum device, and directly below the screens there is a suction chamber and runway for the classified material which empties through an outlet at the end.

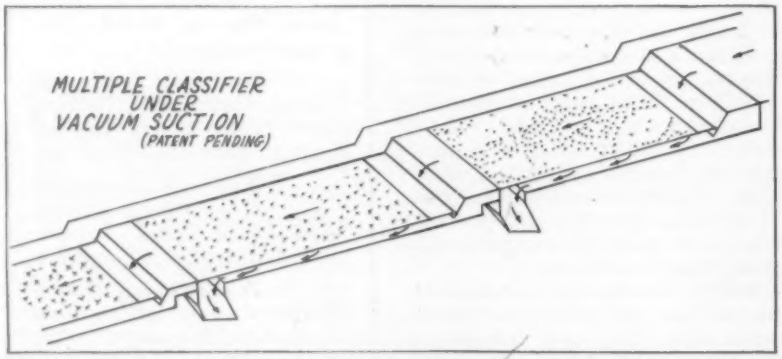
Material fed to the sluice with an adequate volume of water is subjected to a violent suction created by a strong undertow while running over the classifier. At the same time, the flow above is delayed by the uppermost (retarding) screen; the solids are drawn down, and the fines, passing through the classification screen, go into the suction chamber to be carried off through the outlet.

For a classification to several distinct sizes from the same material, the main sluice is elongated and fitted with additional screen sections of the desired mesh. Each section must be provided with its suction device and outlet. Clogging of screens is counteracted by baffle plates placed in such a position that the suction run is partly arrested and reversed at intervals, keeping the screen clean and the oversize moving.



Vertical launder and gravity classifier to separate out fine grades of sand

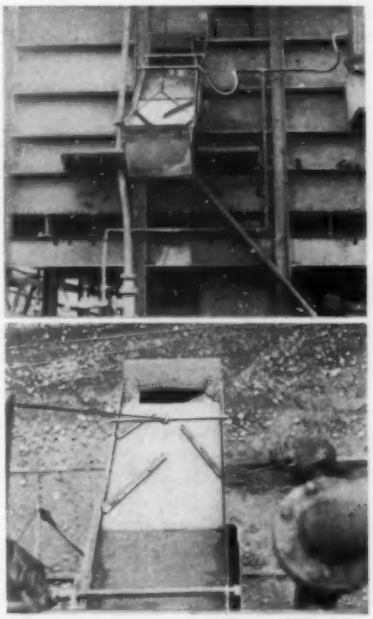
Where a special grade of sand of a certain gravity is desired, the classified material is run through a vertical launder. A countercurrent of adjustable volume and pressure is introduced and forced against the descending pulp with the effect that a gravity classification takes place. The separated lighter particles are expelled through outlets at different levels, those of highest gravity sinking to the bottom where a gate allows their withdrawal. According to H. R. Rambke, mechanical engineer, correct adjustment of the flows permits an automatic performance of the launder with a continual flow of heavy material through the gate without interfering with the runs from the various outlets above.



Multiple classifier developed for mining equipment has application in sand and gravel industry

Rinsing Screen In Chute

In the accompanying illustration is shown a steel chute for loading aggregates into cars at the plant of J. K. Davison and Brother, near New Kensington, Penn. The chute has a screen at its top for rinsing the gravel and has three strips of angle



Above: Movable chute for carloading. Below: Looking down on chute. The screen and angle irons facilitate mixing

iron so located in the chute as to thoroughly mix and intermix the gravel while loading.

Temporary Storage at Primary Crusher

New Enterprise Stone and Lime Co., Roaring Spring, Penn., utilizes an end-dump truck body as a means of building up a reserve and regulating stone fed into a primary crusher. Haulage from the quarry to the crusher is by end-dump trucks with the stationary truck body, shown in the illustration, serving as a means of transfer.

The body, which has been widened to hold seven tons of stone, is tilted hydraulically by twin Heil hoists that were part of the truck from which the body was taken. The oil pump is connected by V-belt to a 2-hp. electric motor. A lever at the crusher is pushed to operate the oil valve, the motor also being started and stopped by the same man.

With this system a truck-load of stone is kept as a standby to be dumped at the will of the operator while other trucks are enroute to or from the quarry. The dumping operation can be stopped at any time in event of an emergency such as a large rock hanging up in the crusher.

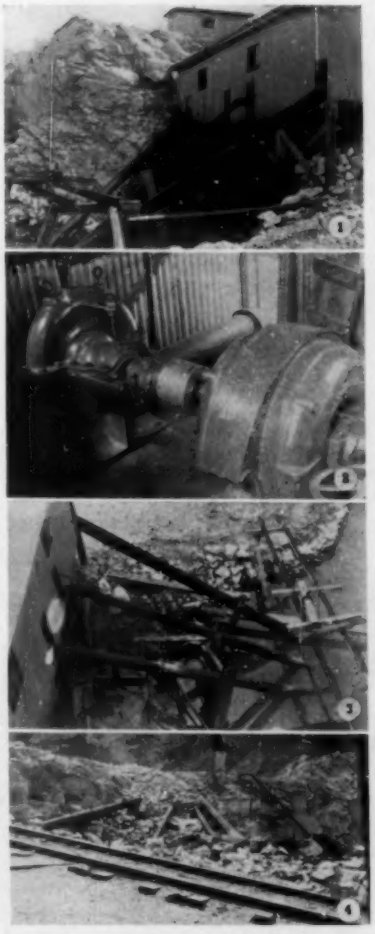
Increasing Water Pump Efficiency

Thomasville Stone and Lime Co., Thomasville, Penn., made some changes in the arrangement and operation of water pumps in its stone quarry which have reduced the pumping effort to a considerable extent and also power costs. The quarry has a drainage sump and employs a battery of four centrifugal pumps to get rid of water. Only in times of high water is it necessary to keep all four in operation.

Three of the pumps are manufactured by the Allis-Chalmers Manufacturing Co. and have a rated capacity of 3000 g.p.m., 1000 g.p.m. and 3400 g.p.m. each powered by 100-hp., 40-hp. and 125-hp. electric motors, respectively. The fourth is a Worthington pump of 1200 g.p.m. capacity driven by a 60-hp. motor. By having pumps of varying capacity the necessary flexibility is provided to fit pump capacity to conditions in the quarry.

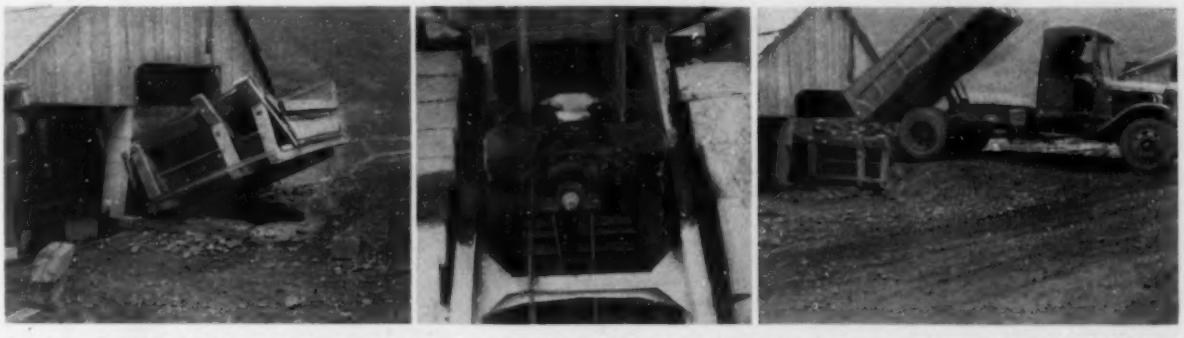
Each pump was equipped with a suction pipe having a diameter 2 in. larger than the discharge line to reduce friction. Until recently, each pump fed into a separate pipeline of 360-ft. length which delivered water into a sewer system that empties into a nearby creek.

Pumping head has been reduced from 178 ft. to about 138 ft. by in-



Top to bottom: (1) Suction pipe from sump to pump house. (2) One of the pumps and motors. (3) Suction pipes and sump. (4) Discharge lines from header. Note four parallel pipes in background going up to sewer

stallation of a 12-in. diameter by 20-ft. header pipe into which all the pumps discharge for distribution into the four pipelines. Greatest savings occur when the pumping plant is not operating at full capacity, which is most of the time. At full capacity of the four pumps, friction builds up to the point where the head reaches that pumped against under the original installation.



Left: Partially tilted position of truck body. Center: Hydraulic hoists elevating body. Right: Dumping into truck body

NEWS ABOUT PEOPLE

KIETH W. WAUGH has been promoted from mine superintendent to plant superintendent of the National Gypsum Co., North Holston, Va., plant.

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A. J. R. CURTIS, assistant to general manager of the Portland Cement Association, and secretary of the Association's committee on accident prevention and insurance, has been elected a trustee of the Illinois Institute of Technology, which has been formed by a merger of Lewis Institute with Armour Institute of Technology. Mr. Curtis has been a member of the Board of Managers of Lewis Institute.

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BERNARD L. MCNULTY, president and general manager of the Marblehead Lime Co., and a trustee of the Armour Institute of Technology, also has been elected a trustee of the newly formed Illinois Institute of Technology.

•

MILTON J. WARNER, president of the Nazareth Cement Co., Nazareth, Penn., has been elected Chairman of the Board; Harold B. Robeson, vice-president and general manager, is now president of the company; and M. Pierpont Warner has been elected assistant to the president.

•

ROBERT B. FROST, assistant superintendent of the Greencastle, Ind., plant of Lone Star Cement Co., has been appointed superintendent of the company's Spocari, Ala., plant. Before coming to Greencastle he had been assistant superintendent of the Lone Star Hudson, N. Y., plant.

•

ROBERT V. SPENCER has been made engineer for Whiterock Quarries, Inc., Pleasant Gap, Penn. Last year he was assistant engineer for the Peoples Natural Gas Co.

•

GEORGE WILLIAM MERTENS has been elected president of the Pacific Coast Co., Seattle, Wash., and all its subsidiary companies to succeed the late N. D. Moore. He is elevated from the position of superintendent of the Pacific Coast Railroad and vice-president of the Pacific Coast subsidiaries, among which are the Pacific Coast Cement Co. and the Pacific Coast Cement Corp.

•

S. CARL SMITHWICK is district engineer of the newly established Portland Cement Association district headquarters for eastern Washington and northern Idaho in Spokane, Wash. This territory hitherto has been under the jurisdiction of the Seattle district office, and Mr. Smithwick for the last 10 years represented the association in it.

•

L. C. HART has been elected vice-president of Johns-Manville Sales Corp., New York, N. Y. In addition to his new duties he will continue as general sales manager, a position he has held since 1935. Mr. Hart has seen 26 years of service in the firm.

•

ALBERT Y. GOWEN, chairman of Alpha Cement Co., Ltd., England, and formerly vice-president of the Lehigh Portland Cement Co., was in Denmark April 9 when German troops invaded the country. He relates in the August 19 issue of *Life* magazine the conversations he had with the German authorities and army officers before he managed to get out of the country.

•

H. HERSHEY MILLER has been appointed resident engineer of the Pennsylvania Sand and Gravel Producers' Association, with offices in Harrisburg. He was formerly with the Pennsylvania Turnpike Commission and Pennsylvania State Highway Department.

•

CHARLES E. KIETZMAN has joined the Dewey Portland Cement Co., Dewey, Okla., plant staff as assistant superintendent. He was with the Lehigh Portland Cement Co. at Iola, Kan., for 18½ years, serving as chief electrician during part of this time. P. S. Chamberlain, general superintendent, is absent from his work because of illness, and Geo. W. Cross is acting superintendent.

•

PROFESSOR WALTER C. Voss has been appointed head of the newly established department of building engineering and construction at Massachusetts Institute of Technology. Well-known particularly to the lime industry for his investigations of lime mortars, he has been in charge of this course under the department of civil and sanitary engineering. Professors Dean Peabody, Jr., and Howard R. Staley and Mr. Albert G. Dietz will be associated with him.

•

J. A. F. WENDT of the United States Gypsum Co. has been elected a director of the National Lime Association to represent with Reed C. Bye member companies in District 3.

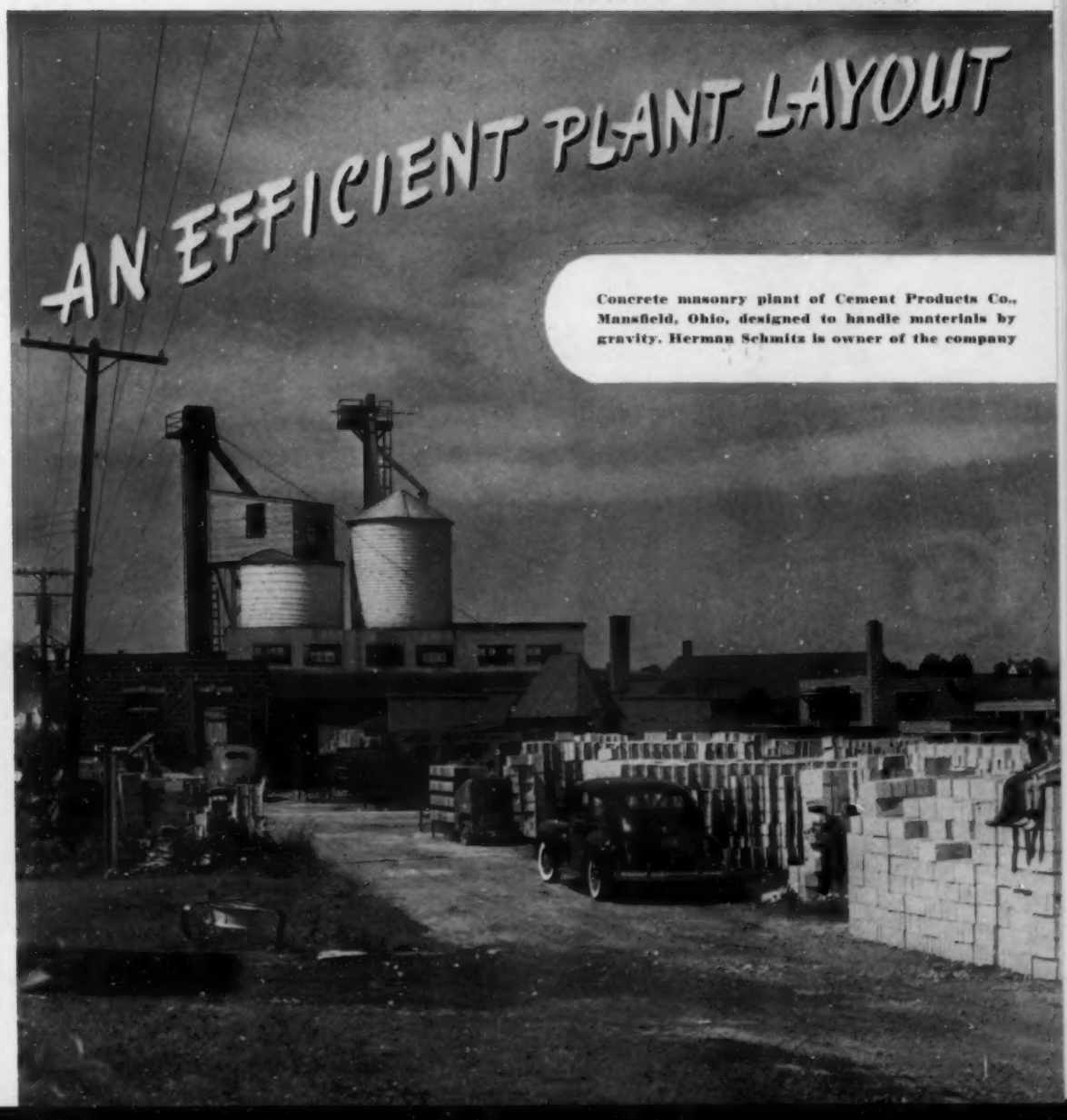
•

(Obituaries appear on page 86)

New Enterprise Stone and Lime Co. had the largest single order for crushed stone used on the Pennsylvania Turnpike, and these three younger members of the Detwiler family masterfully directed plants in peak production. Left is Dale, superintendent of the Roaring Spring, Penn., plant, which furnished asphaltic stone. Center is Galen and right, Emmert, who together were in charge of the Ashcom, Penn., plant, located on the Turnpike. At times they operated it 24 hours a day

CONCRETE PRODUCTS AND CEMENT PRODUCTS

AN EFFICIENT PLANT LAYOUT



Concrete masonry plant of Cement Products Co., Mansfield, Ohio, designed to handle materials by gravity. Herman Schmitz is owner of the company

Cut Down Handling Costs

Efficient trackage system provides straight line production of brick and block. Two-stage curing reduces pallets

By RALPH S. TORGERSON

A VISITOR to the plant of the Southern Concrete Products Co. in New Orleans, La., does not find new buildings, but he is impressed with the very efficient way in which they have utilized facilities originally used to make sand-lime brick.

Three high-pressure steam cylinders were found to be in good condition and are now employed for curing concrete brick and block. Much of the trackage is also used, but many changes in layout were required to achieve the present efficient system and further improvements are contemplated.

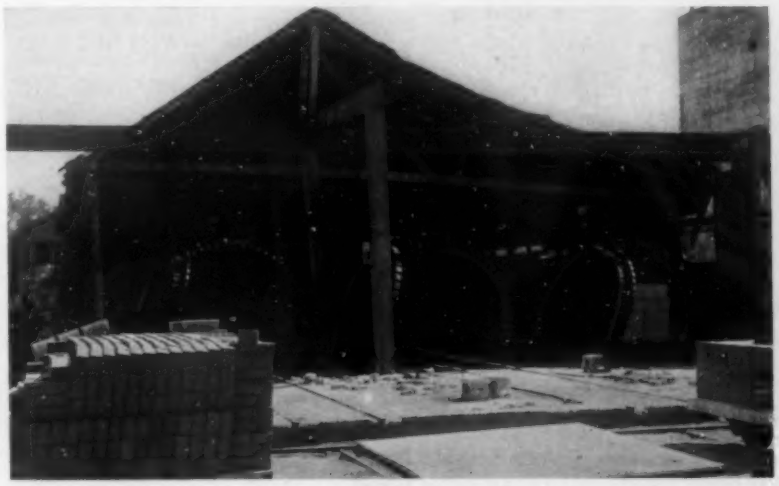
Reference to the plan drawing shows the interesting trackage layout to serve brick and block machines and the low pressure curing tunnels and high pressure steam cylinders.

Sand and gravel aggregates, 300 cu. yd. per load, are received by boat from a canal slip immediately back of the plant, and are unloaded with a dredge bucket. Lightweight Superock aggregates are obtained in carload lots on the adjacent rail siding. Aggregates are elevated by bucket elevator to the two steel 40 cu. yd. bins which are equipped with Fairbanks scales for batching. One bin is divided in half, one compartment holding graded sand and gravel and the other compartment, fine Superock. The second 40 cu. yd. bin holds coarse Superock. Traveling on rails below the bin spouts is a 28 cu. ft. mixer mounted on wheels and operating on a track which permits movement from one bin spout to the other with one-man operation for weigh batching, mixing and dumping. Sacked cement is on a platform above the mixer, and water has been piped and metered within convenient reach.

Two Anchor tamper type block machines each have a capacity of 125 8- x 8- x 16-in. blocks an hour. The mix is approximately 1 to 7 of cement and lightweight aggregates. Superock aggregates in the mix comprise two parts of fine, ¼-in. to dust, and one part of coarse, ½-in. to ¼-in. Silica flour is added to the mix to supply deficiency of silica in cement, for purposes of high pressure steam curing.

Train of empty rack cars for concrete brick with brick machine in the background and low pressure steam tunnel to the right

Block coming from the machine are carried on pallets directly into the three nearby low pressure steam tunnels, each holding 750 block. Curing room walls are laid up with concrete block, every other tier being offset



High pressure steam cylinders for final curing. Note depressed transfer track in front of cylinders

Showing how loaded racks are moved into curing cylinders from transfer car

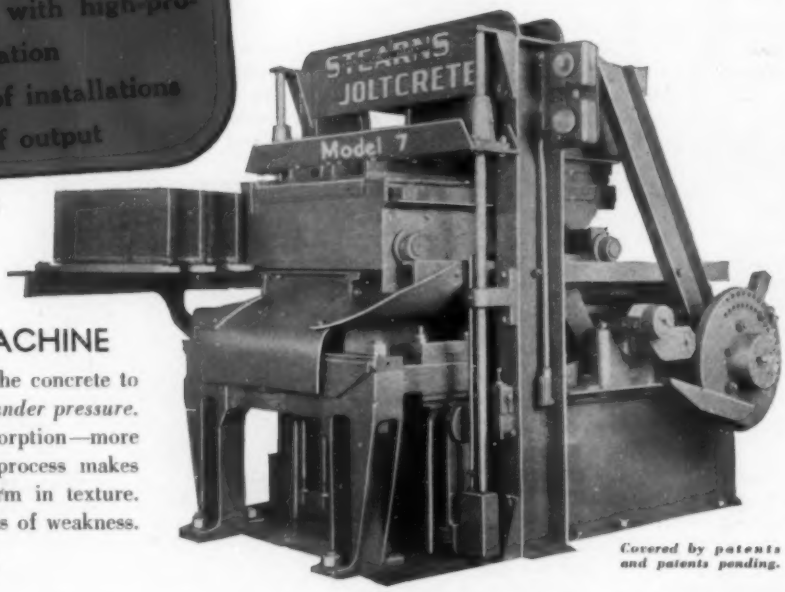
first

A—in the field with high-production vibration

B—in number of installations

C—in quality of output

Stearns Joltcrete is made in three sizes with capacities second to none. Uses your present cored pallets or inexpensive new ones. (Ask for pamphlet "The Advantages of Cored Pallets.")



Covered by patents and patents pending.

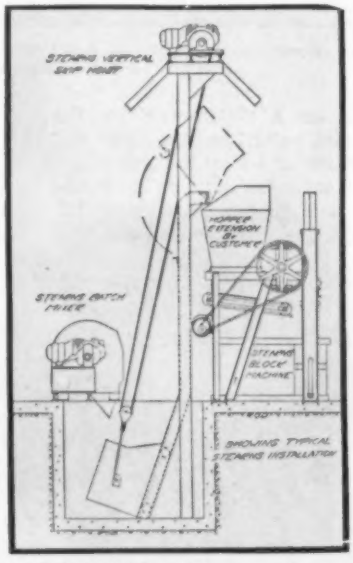
STEARNS JOLTCRETE MACHINE

Only Stearns JOLTCRETE subjects the concrete to *limited amplitude vibration—vibration under pressure.* This assures high strength—low absorption—more blocks per bag of cement. No other process makes blocks so clean cut, true-to-size, uniform in texture. There are no core bar marks—no planes of weakness.

There are no "ifs" and "ands" about JOLTCRETE. The famous Wisconsin tests, the steadily mounting sales (more than 100 in operation) of these machines, and their performance record in the field, simply add to the mass of evidence that JOLTCRETE surpasses all competition. The JOLTCRETE pioneered process of making blocks by *vibration under pressure* is fully covered by patents and patents pending.

STEARNS CLIPPER STRIPPER

Ideal for small plants and, in batteries, achieves low production costs in large plants. Eight bar tamping produces dense, uniform blocks, increases block yield per bag of cement. Made in four models, with down-face, rock face and brick attachments available.

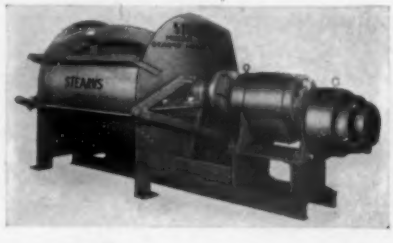


STEARNS Skip Loaders

for charging dry materials into elevated mixers or for elevating mixed concrete to feeding hoppers. Independent and mixer drive types. May be used with any make of mixer. Proper track and cable lengths permit wide range of application.

STEARNS MIXER

The mixer with the interchangeable, renewable, bar type liners of abrasion resisting steel. "Sterloy" ribbon blades—paddle type optional. Heavy steel shell electrically welded to steel ends. Quick acting, tight locking, leak proof discharge door is on operator's side. Low charging height. Bearings perfectly protected. Pulley, Gear-Head Motor Drive. Skid or truck mounting. Five sizes—3, 12, 18, 28 and 42 cu. ft. *Prompt shipment from stock.*



Complete Concrete Products Plant Equipment

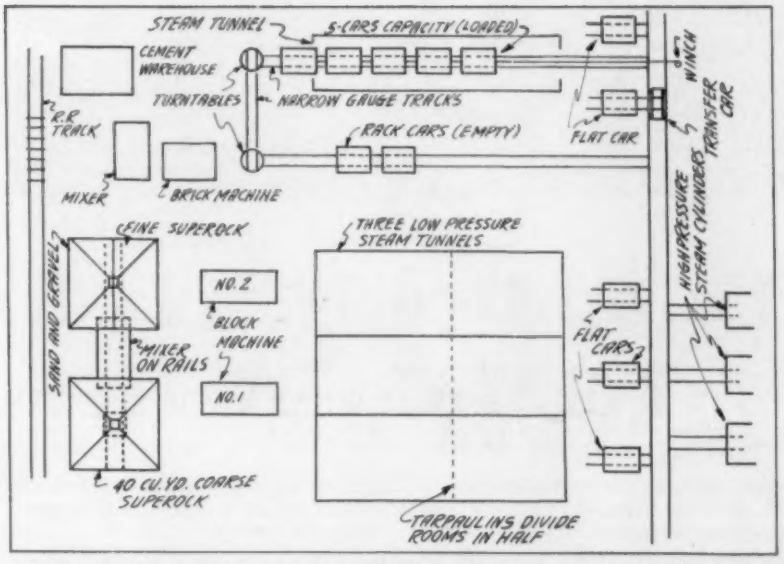
STEARNS MANUFACTURING CO. - ADRIAN, MICH.

GENE OLSEN, PRESIDENT

Write for folders on the machines you are interested in

about an inch from the vertical to provide a series of ledges on which angle iron sections are laid to form shelving to place "green" concrete block. When half the room has been filled, about 375 block, a tarpaulin is dropped down and the low pressure steam turned on. The next half of the room is then filled with block, the procedure continuing until the last half of the third curing room has been filled. By the time green block are going into the third curing room, the block in the first room are sufficiently set to permit their removal to a small flat car on rails for transfer into the high pressure steam cylinder for curing.

This procedure reduces the necessity for a large stock of pallets. Only 500—8- x 12- x 16-in., 700—8- x 8- x 16 in., 400—6- x 8- x 16-in., and 300—4- x 8- x 16-in. pallets are carried in stock. The plant has a production of over 2000 standard 8- x 8- x 16-in. block per 8 hr. day.



Layout of plant to show how concrete brick and block are produced by mass production methods

Block on the flat cars going to the curing cylinders are moved to a transfer car on a wider gauge track, at right angles to the tracks entering the cylinders. This permits loading any one of the three cylinders.

A 125 hp. Heine water tube boiler fired with bunker C fuel by a 250 hp. Ray oil burner provides steam at 110 p.s.i. for the cylinders. This pressure is expected to be raised to 125 p.s.i. The boiler, which was designed by James M. Todd, consulting engineer, New Orleans, La., has an oversize fire-box to allow for overloads, if necessary. Steam pressure is maintained for 8 hr. at 110 p.s.i., at the end of which time it is allowed to drop down gradually. A period of three hours is required to build up pressure. The high pressure cylinders hold 3600 standard block or 36,000 brick.

A set-up similar to concrete block is available for the production of concrete brick. Brick are made on a Dunbrik machine, using a Pearl River sand, ¼-in. down, and cement in a 7 to 1 mix. Special rack cars on a track in front of the brick machine are moved to a turntable and placed on a track leading through a steam tunnel. This tunnel has a capacity of five cars of brick, and as each car is lined up it is hooked to the car ahead, the entire train being pulled forward with a cable by means of a hand winch. As the first car reaches outside the building, the brick are placed on flat cars for transfer to the high pressure steam curing cylinders. Sufficient time has elapsed for the brick to become hard enough so that they may be removed from pallets and stacked on the flat cars. This permits continuous operation with only seven rack cars and 2000 pallets, each holding three brick. About 15,000 concrete brick can be made in an 8 hr. day.

In addition to concrete brick and block, the company makes concrete joists, slabs, chimney caps, and miscellaneous concrete castings. High early strength cement is used in making joists. Aerocrete concrete products also are cast, and a 3- x 12- x 24-in. sound proofing tile is steam cured.

Contrary to the usual trend, Southern Concrete Products, Inc., does not depend on a demand for residential building products. Its largest business is in exposed and back-up walls and partitions for commercial structures, and the high pressure cured units are in such popular demand that little opportunity is available to stock various sizes. Paul D. Lemann is president of the company and E. B. Diboll is secretary-treasurer.

Weigh batcher to proportion aggregates dumped into concrete mixer

Tamper type block machines receive concrete mix from the batching unit in background; steam curing tunnels, not shown, are in front of machines

General view of new concrete masonry plant in which accurate proportioning controls are used in mixing aggregates, cement, and water

Using Ready Mix Experience To Make Better Blocks

PRACTICAL EXPERIENCE gained through years of ready-mixed concrete production has been incorporated into the design of an entirely new concrete products plant built by the Cleveland Builders Supply Co., Cleveland, Ohio.

C. E. Ehle, manager of all operations of the Cleveland Builders Supply Co.

J. C. Ehle, his son, superintendent of the company's new concrete block plant

This is particularly true of the design and equipment for proportioning and controlling the mix. Operating procedure is based on the sound and inviolable principle of uniformity of products.

Proportioning, and the frequent and regular testing of aggregates and the concrete, are the means of guaranteeing that each unit will be the same as all the rest. In Cleveland, concrete building units are specified on the basis of strength. Cleveland Builders Supply Co. has set a standard for compressive strength over and above the 1200 p.s.i. at 28 days net area set by the building code, and also stresses workmanship. By workmanship is meant surface texture as well as trueness in dimensions and edges. As Cleveland architects and builders favor, and demand, a smooth-textured unit, the standard for units which is to be followed, proportioning of the aggregates and the mixing water are governed to meet this requirement.

Capacity of the plant is 9000 or more 8- x 8- x 16-in. equivalent units in a 9-hr. day which is large for a new plant. The largest volume sold thus far has been on types of construction requiring considerable quantities, such as partitions and backup in large buildings. All the production is of lightweight concrete, using Celotex Pottsco as aggregate.

Use Lightweight Aggregate

A Pottsco, lightweight slag aggregate manufacturing plant was established at the same time in Cleveland and is being operated under a Celotex franchise. This plant was built by the Cleveland Slag Co. on the site of its slag crushing plant and practically all its output is used by the Cleveland Builders Supply Co. to make concrete units. Some of the production has been made available by the latter concern to outside sources within reasonable shipping distances.

A blast furnace slag, while still in a red, molten mass is treated with cold water and steam, the sudden chilling causing the formation of the separate cells in the slag which give to it lightness and, to concrete made from it, good insulation, sound absorbing qualities and nailability. Clinkers formed from this treatment

Showing how loaded racks are handled rapidly over concrete pavement in the storage yard

are then crushed and graded into two standard sizes of aggregates.

Locomotive cranes re-handle the clinkers from stock into a hopper feeding a 24-in. coal crusher in the Pottsco plant. A belt conveyor takes the product of this crusher into a 3-ft. Symons standard cone crusher and its output is elevated and screened over a 4- x 8-ft. double-deck Niagara vibrating screen. Screen decks have ½- x ⅜-in. openings on the top deck and ¼-in. square openings below. Overs return to the reduction crusher and the two sizes are put through separate spouts into railroad cars for stockpiling.

The plant is geared to produce about 80 percent fines and the remainder is a coarse product; this proportion being desired to produce the smooth surface sought by Cleveland architects.

Coarse aggregate weighs 48 to 52 lb. per cu. ft. and has an approximate analysis of 100 percent passing a ½-in. screen, 40 percent through a No. 4 sieve, 20 percent through No. 8, 10 percent through No. 16, 4 percent through 50-mesh and 3 percent under 100-mesh. Fine aggregate weighs 59 to 65 lb. per cu. ft., and has 98 percent minus the No. 4, 63 percent through No. 16, 30 percent through No. 30, 15 percent less than 50-mesh and 7 percent through 100-mesh. These are typical grading analyses. Use of these aggregates in the 80:20 ratio produces an 8- x 8- x 16-in. concrete block weighing 29 lb.

Manufacturing Procedure Depends on Gravity

Aggregates are trucked, 8½ tons to the load, a distance of four miles to the concrete products plant, which has been located and built for economical handling. The plant is located partly on a hillside and partly on the valley floor below to get the benefits of gravity handling. Tops of the bins are flush with the top of the hill where there is a roadway for the trucks hauling aggregates, and the machine floor, curing kilns and stockpiling area are on the floor below. The batching floor in the plant is beneath the bins and on a floor level above the block machines.

Ample space is provided in this plant for maneuvering empty and loaded racks. Note mixers on floor above block machines and light and airy appearance of room

One of the two new concrete block machines in action

Setup for manufacturing lightweight slag aggregate

Two sizes of aggregates are stored in two compartments of a Butler steel bin with a capacity of 150 tons. A separate compartment is available for bulk cement which is also trucked to the plant. When the company started block production in January 1940, it was equipped with a No. 9 Stearns Joltcrete machine but the batching floor and plant floor space had been laid out for expansion. A second block machine of the same type and size was installed June 1, 1940. This equipment was purchased through Anchor Concrete Machinery Co.

Each block machine has an individual 42-cu. ft. Stearns batch concrete mixer just above it, and a Butler lorry batcher, equipped with a 3-beam scale and having a capacity of 56 cu. ft., serves both mixers. The batcher is hand-propelled and is moved on an overhead track.

Two sizes of aggregates and standard portland cement are individually weighed with accuracy before charging the mixers. The cement bin is kept only partially filled to prevent the packing of cement within it. This practice is of benefit in keeping the cement fluid and free flowing by preventing packing and arching.

Normally 40 cu. ft. of material is charged into the mixers rather than to their full capacity, and batching is done by converting weight to a volume basis. Aggregates are dry mixed for three minutes before the cement and water are dumped into the mixer. Water is then added and mixed with the aggregates another three minutes and this is followed by a three-minute period after the cement is introduced. Each batch of 40 cu. ft. contains 24 gal. of water, which is metered accurately.

Weight tests of the aggregates are run twice daily and sieve analyses every day as a check on the propor-

(Continued on page 71)

Delegates and guests to the convention of the National Cinder Concrete Products Association assembled on the board walk, Atlantic City, N. J. President Geo. W. Goelitzer is enclosed in a circle

Promoting Cinder Concrete

National Cinder Concrete Products Association discusses merchandising and improved manufacturing methods

More than 175 members and guests attended the Seventeenth Annual Convention of the National Cinder Concrete Products Association at the Traymore Hotel, Atlantic City, N. J., on August 5, 6, and 7.

The three-day program covered a wide range of subjects and included for the first time a manufacturing clinic and a merchandising clinic. Informal discussions of important problems in clinic groups brought out suggested solutions that were of value to large and small producers, and the feeling was unanimous that the clinic idea was the outstanding feature of the convention.

A preparedness program for the industry was proposed by W. G. Kaiser, manager, Cement Products Bureau, Portland Cement Association. He warned that manufacturers must expect greater competition and suggested that stress should be laid on the manufacture of high quality units, the proper use of such units in building construction, an aggressive merchandising program, continued research, and the development of new uses for concrete products.

Professor P. Samuel Leonard, of Drexel Institute of Technology, Philadelphia, discussed the test procedure and results obtained when a composite wall of brick with cinder concrete block backing was tested for the Building Bureau of the City of Philadelphia. This test was conducted to show the fire resistance of such a wall and secured approval for such construction within the city, increasing the market for cinder units. Charles A. Flanagan, Chief of Building Inspection, followed Professor Leonard with a statement of appreciation to the cinder products industry, for coöperation in such tests.

Other papers presented on the opening day were "The Elements of Control and Research in a Cinder Concrete Products Plant," by A. L. Bowling, Cinder Products, Inc., Roanoke, Va.; and "Fire Resistant Requirements as Related to Building Codes," by S. H. Ingeberg, Chief, Fire Resistant Section, National Bureau of Standards, Washington, D. C. Mr. Bowling said that refinement control should include: A reduction in combustible content of cinders, grading of cinders by specification, use of admixtures to reduce shrinkage and increase strength, tests of curing reactions, development of low sound transmission and high sound absorption, and improvement of waterproofing.

On Tuesday morning A. Harry Wagner of the Philadelphia office of the P.C.A., outlined the organization of individuals that produced the successful developments of concrete masonry houses in that city, and suggested that these groups be formed elsewhere. In such groups were the following; an aggressive concrete masonry manufacturer; a modern builder; an active realtor; a clever architect; a favorable lending agency; and an experienced developer. There is still a shortage of homes for the persons in the low income brackets and coöperation is the way for sales of the concrete house to these people.

Douglas E. Parsons, Chief, Masonry Construction Section, National Bureau of Standards, Washington, D. C., discussed wall facings for prevention of rain penetration. The re-

Produces better blocks with sharp edges and mortar grooves.

A light weight pallet which fits closer to the core box.

Less storage space required.

Lowest investment and maintenance cost.

Commercial PRESTEEL Close Clearance Pallets are more durable because they are formed cold, under pressure increasing their strength.

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The COMMERCIAL SHEARING & STAMPING COMPANY
YOUNGSTOWN, OHIO

LOW INITIAL COST
LOW MAINTENANCE COST

Chase "all steel" Block racks are built to suit your individual requirements. Our experience and engineering will give you a rack with the proper dimensions and arrangement for loading your product and the proper under clearance to work with your lift truck.

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for Catalog and
Special Low Prices

Complete line of concrete block cars, decks, Lift Truck Racks, transfer cars, turntables, dump cars, etc.

CHASE DRYER CARS & TRANSFER CARS
CHASE FOUNDRY & MFG. CO. COLUMBUS, OHIO

"FIRESAFE CONCRETE HOMES" *is my policy!*

Columbus builder one of many winning new profits and prestige with this fast-growing construction.

Consider the case of R. M. McCormick of Columbus, Ohio. He stepped out with a "concrete only" policy, building ten new houses last year, seven the first half of 1940. Today he is more sold than ever on concrete's value to his clients and to his own business.

More Builders Cashing in on Concrete's Economy and Beauty

Builder McCormick is one of a growing list of builders whose enthusiasm for concrete is directing new business to concrete products manufacturers, concrete contractors and ready-mix firms. In one city, for example, 55 different builders erected one or more concrete homes last year.

Build Demonstration Homes—Advertise

The advantages of concrete homes, such as firesafety . . . superior livability . . . fine appearance . . . economy and permanence, are well known to you. But the public needs to be told over and over again. There is big residence volume ahead in many cities, and builders will find it mighty good business to build *concrete demonstration homes* and feature concrete aggressively in advertising and selling.

PORTLAND CEMENT ASSOCIATION
Dept. 9-45, 33 W. Grand Ave., Chicago, Ill.

A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work.

sults of laboratory tests indicate that over cinder concrete units, the following are very successful: stucco as per A.C.I. specifications, cement paint applied with a stiff fiber brush, and brick laid with care and good workmanship.

Paul Smith of the Newark, N. J., office of the F.H.A. gave a short address telling of the New Jersey boom in the small house field. He then introduced John M. Dobbs, special representative for Stewart McDonald of the Washington, D. C., office of the F.H.A. Mr. Dobbs told about the increase of insured mortgages being made both in numbers and amounts, tracing this progress through the six years that the F.H.A. has operated. He suggested that whenever the products men sold masonry units for houses that it was wise to see that the house had a pleasing architectural treatment, as some of the horrible examples on masonry homes had set up some sales resistance.

P. W. Kniskern, president of the First Mortgage Corporation of Philadelphia, Penn., discussed a number of factors that would probably have economic bearing on residential construction. War, Conscription, Labor, Taxes, Immigration, and others are factors to bear in mind when planning your next year's business.

The prevention of cracks in masonry walls was made a floor discussion by Charles P. Lower of Bethayres, Penn., and the best conclusion from this was that the manufacturers had better look to their own processes of curing and drying cinder units, first; then assist builders in preventive measures in construction. He also suggested the placement of ¼-in. bars over lintels and under sills.

L. P. Kooken, engineer for the Breeko Corporation, discussed the increase in their sales of cinder units by use of cinder filler units in concrete floor systems. While floor units increased their sales 33 percent, it was not a simple job. The salesman must be a qualified engineer, able to answer architectural and engineering questions of design. This must be followed by cost analysis and job construction assistance. Slides showing details of construction and design amplified this talk.

Officers and Directors

New officers for the coming year are as follows: President, George W. Goelitzer, Cinder Concrete Products, Inc., Kansas City, Mo.; vice-president, Cloyd B. Fellabaum, National Cement Products Co., Toledo, Ohio; vice-president, Herbert A. Davis, Washington Concrete Products Corp., Arlington, Va.; secretary-treasurer, Harry H. Longenecker, Penn Building Block Company, Inc., Philadelphia, Penn.

Directors include the officers and George H. Krier, Nailable Cinder Block Corp., Brooklyn, N. Y.; Alden C. McGuire, Comac Builders Supply Corp., Rochester, N. Y.; Herbert J. Vincent, Cinder Block, Inc., Detroit, Mich.; and Sam Paturzo, V. Paturzo Bro. & Son, Inc., Baltimore, Md.

The meeting was concluded with a luncheon given by the Stearns Manufacturing Co., Adrian, Mich., for all the Stearns equipment users present.

New Concrete Block Plants and Improvements

VIBRATED CONCRETE CO., Clay Center, Kans., is building a new concrete block structure 30- x 120-ft. The company, owned and managed by Don Wheelock, Jr., manufactures block, tile, brick and pipe.

•

SOO SAND AND GRAVEL CO., Sault Ste. Marie, Mich., has purchased a Besser block machine with a capacity of 1500 block per day. James Lapish, manager, has announced that screening and other equipment will be provided to prepare cinders.

Controlling Mix For Concrete Products

(Continued from page 67)

tioning accuracy. Mixes are corrected to correspond with the test results. Steam coils are already in place for winter operation and the bins are equipped for the introduction of live steam in cold weather.

Other features of the plant which are worth special mention are its spaciousness and permanent construction. The main plant is completely daylighted with practically continuous windows all the way round. It makes for ideal working conditions under natural light most of the time.

Curing is done in five kilns, using low pressure steam at 6 p.s.i. These kilns are built with a clear vertical height of 8 ft. which helps materially in handling racks of cars into them and outside to open stockpiles. A gasoline-powered 1-ton Clark "Truktractor" moves the loaded and unloaded racks around the plant.

Racks are the Chase hinged type which enable each deck to be tilted up on its hinges in filling and removing units. Over 80 of these racks are now in use, and the number will be increased to 130 as production increases. Each kiln holds 33 racks when full, giving a kiln capacity of 11,880 (8- x 8- x 16-in. equivalent) units.

Steam is applied for 18 hr. before removal into open stockpiles. Headroom into the plant is high enough so that empty racks can easily be returned to the machines by the lift truck with the rack decks in the raised position ready for filling. Handling around and from the machines is systematized to the point where each machine is capable of producing 11 standard block per minute.

Stockpiling space is practically unlimited, and it is the intent of the company to build up and maintain a regular stock of 500,000 concrete units, none of which will be delivered until they are 28 days old. A total of 1400 ft. of concrete runways 8 ft. 4 in. wide have been laid in the stockpile area for use by the lift truck and delivery trucks in getting to the various tiers of blocks.

All the regular block sizes are manufactured, including 8- x 8- x 16, 4- x 8- x 16, 3- x 8- x 16, 8- x 12- x 16, headers, half blocks, brick, etc. These are tested for strength and absorption at regular intervals. Every unit is trade-marked in accordance with a building code requirement, the stamp indicating the date of manufacture and an identifying number which in this company's case is "Pottsco."

C. E. Ehle, manager of all operations for the Cleveland Builders Supply Co., including ready-mixed concrete and the production of sand and gravel, designed the plant. Mr. Ehle is well known in the concrete industry as the president of the Ohio Ready Mixed Concrete Association with headquarters in Columbus, Ohio. His son, J. C. Ehle, is superintendent of the new unit which is known as the company's "Hugo" plant.

Ready Mixed Concrete Activities

PINE BLUFF SAND AND GRAVEL CO., Pine Bluff, Ark., has started a ready mixed concrete division. Two new 1½-cu. yd. truck mixers mounted on Ford chassis have been purchased. Ready mixed concrete service will be given within a radius of 20 miles. Wallace McGeorge is in charge of the new department.

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JACK E. MARTIN, who has been in the ready mixed concrete business in Walla Walla and Portland, Ore., has started the Dishman Ready-Mix Concrete Co., Opportunity, Wash. A temporary office has been established in the Dishman Lumber Co. building.

National Gypsum Leases Chemical Lime Plant

THE NATIONAL GYPSUM CO., Buffalo, N. Y., will lease the plant of Chemical Lime Co., Inc., Bellefonte, Penn., for 16½ years under a proposal submitted to the RFC which has extended loans of $750,000 to the lime company. Under the reorganization plan for the lime company, the RFC will provide $350,000 more in funds to complete and rehabilitate the plant. The lease provides for the payment of $80,000 annually by National Gypsum which, after deduction of 3 percent interest on the RFC total loan of $1,050,000, would be used to amortize the loan. National Gypsum has the option to buy the property by paying off the unamortized RFC investment.

Construct Aggregates Plant In New York

ROSSOFF SAND AND GRAVEL CORP., a subsidiary of Samuel R. Rossoff, Ltd., New York, N. Y., is building a large sand and gravel plant at Kerhonkson, N. Y., to supply aggregates for the 90-mile water tunnel and aqueduct contract. Smith Engineering Works, Milwaukee, Wis., is reported to have supplied $65,000 of equipment for this plant, including: seven vibrating screens, two feeders, a primary crusher, secondary crusher, two scrubbers, six belt conveyors and a 1500-ton storage bin also are included.

Virginia To Buy Limestone Grinding Equipment

APPROVAL has been granted by the Virginia Board of Agriculture for the expenditure of $20,000 for the purchase of new grinding equipment to replace the present plant at Appomattox. It is expected to increase the capacity of the limestone grinding equipment from 12 to 30 tons. L. M. Walker, Jr., State Commissioner of Agriculture, was empowered to consummate the purchase.

Investigate Colesville Quarry-County Project

BINGHAMTON, N. Y., newspapers have published testimony concerning the $235,000 quarry project of the county to supply crushed stone for WPA work. The testimony before the Board of Supervisors brought out that no test borings were made to determine the quality of the stone, the extent of the deposit and overburden, and the anticipated costs of production. It is reported that Clifford L. Robinson, highway superintendent, and one of those who had favored the project, said the present cost of producing crushed stone was

$2 a ton. Daniel F. Conroy, a former contractor and quarry man and now investigator for the State of New York, is reported to have stated that not more than 2½ percent of the stone was hard rock, the rest being shale and dirt.

Making Rock Wool

BUILDING GUARD ROCK WOOL CO., Memphis, Tenn., is starting the manufacture of rock wool on September 1 in the plant formerly occupied by the Stryker Kotn-Wood Products Co. Huntington Van Dresser is manager and one of the owners and H. S. Nelson of Phillips County, Ark., is the other owner. About 25 men will be employed in the new venture. It is said that slag, limestone and silica will be used in making rock wool.

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It is proposed to erect a $60,000 rock wool plant at Arkansas City, Kans. The proposal was presented to the city by Thad Wilson of Kansas City, Mo.

1000 Days Without An Accident

MARQUETTE CEMENT MANUFACTURING CO., Cape Girardeau, Mo., recently celebrated an unusual safety record by operating its plant 1000 consecutive days without a lost-time accident, according to an announcement by Safety Engineer M. P. Greer. The plant is now eligible for membership in the 1000-Day Club of the Portland Cement Association. Only three other plants in the country have achieved this record.

Build "Hot Mix" Plant

BOWSMAN SAND AND GRAVEL CO. has completed the construction of a plant for the production of a "hot mix" on property of the American Aggregates Corp., at Urbana, Ohio. It is said that the plant cost approximately $60,000, and has a capacity of 1000 tons daily. The Bowsman company has three large road construction contracts in the vicinity.

Gypsum Continues Gains

BUREAU OF MINES reports that the gypsum industry for the April-June period of 1940 operated at higher levels of capacity than for a similar period in 1939. Raw gypsum sales, principally for portland cement manufacture, were 14 percent ahead of a year ago; industrial plasters 19 percent higher, 33-1/3 percent higher to plate glass and terra cotta manufacturers. Gypsum lath sales were 25 percent higher for the six months period, and wall board also showed big gains.

Plan to Make Lime in Arkansas

W. S. BRANNINGHAM, Fayetteville, Ark., who has several crushed stone plants in northwest Arkansas, has installed an agricultural limestone crushing plant on the Gulley land between St. Joe and Pindall on the M. & A. railway. The initial capacity is 100 tons per day. Later it is planned to install a kiln and hydrating plant to produce lime.

Building Lime Plant In Nevada

THE UNITED STATES LIME PRODUCTS CO., San Francisco, Calif., plans to erect lime kilns at a recently acquired deposit near Nixon, Nev. The principal plant of the company is located at Sonora, Calif.

More Bin Storage

SAN ANTONIO PORTLAND CEMENT CO., San Antonio, Texas, will receive bids September 4 for the construction of two cement silos at Cementville; each bin to be 32 ft. in dia. and 70 ft. high. With conveyor equipment, the cost is estimated at $40,000.

Cement Plants Reopen

LEHIGH PORTLAND CEMENT CO. plants at New Castle, Penn., and Metaline Falls, Wash., have resumed operation after shutdowns for repairs and modernization.

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LONE STAR CEMENT CORP. has placed two kilns in operation at the Bonner Springs, Kans., plant after a two-month's shut-down.

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UNIVERSAL ATLAS CEMENT CO. has started up another kiln at Independence, Kans., increasing the production to 50 percent of capacity, according to local reports.

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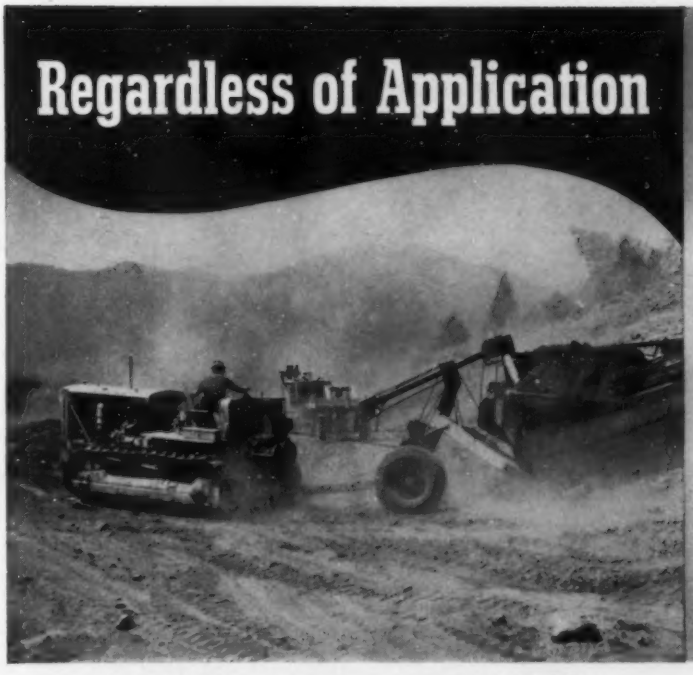
MARQUETTE CEMENT MANUFACTURING CO. has resumed operations at the Oglesby, Ill., plant.



HAZARD LAY-SET *Preformed* Handles Easier

GREEN SIGNIFIES SAFETY

Whether it is on a carryall, dragline, concrete mixer, power shovel, clamshell, skip hoist—or what not—Hazard LAY-SET Preformed is appreciated by the workmen *because it handles easier*. The preforming process, back at the mill, gives it that advantage. Preforming eliminates internal strain thereby making LAY-SET limber, flexible, easy to reeve. Therefore, LAY-SET resists kinking, resists rotating in sheave grooves, resists the fatigue of bending. LAY-SET requires no seizing as it won't fly apart when cut.

Crown wires that finally wear through will not porcupine to tear workmen's hands and possibly cause blood poisoning. This makes Hazard LAY-SET Preformed a *safer* rope to use. Small wonder the workmen like it.

The bosses in the office like it, too, for the records reveal that Hazard LAY-SET Preformed lasts longer. *Much* longer. That means less frequent rope replacements and shutdowns—more work done.

Specify Hazard LAY-SET Preformed for your next line. All Hazard ropes made of Improved Plow Steel are identified by the Green Strand—and remember, Green Signifies Safety for both men and pocketbook.

HAZARD WIRE ROPE DIVISION

Established 1846

AMERICAN CHAIN & CABLE COMPANY, INC., WILKES-BARRE, PA.

District Offices: New York, Chicago, Philadelphia, Pittsburgh, Fort Worth, San Francisco, Denver, Los Angeles, Atlanta, Tacoma

PRICES BID
Contracts Let

FALL RIVER, MASS.: Thomas J. McDonald was lowest bidder on gravel to the city for the rest of the year. His offer was 52c a cu. yd. delivered, with a 2 percent discount allowance for 10-day cash payment.

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BEARDSTOWN, ILL.: Contract was awarded to Curtis Logsdon to furnish 412 tons of coarse aggregate at $1.55 per ton.

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EASTON, PENN.: The lowest bidders on pea gravel were the Portland Sand and Gravel Co. and the Warren Sand and Stone Co., who submitted identical bids of $1.19 a ton for 2522 tons. Each was awarded a contract for half the amount. The latter firm also was given contracts for 2131 tons at the same price and 2370 tons at $1.05. Steckel Sand Co. received a contract for 2042 tons at $1.

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MOLINE, ILL.: Moline Consumers Co., low bidder, was awarded contract to furnish crushed stone at $2.30 a cu. yd. for improvement of the old camp ground road.

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QUINCY, MASS.: Old Colony Crushed Stone Co. was low bidder for 18,000 tons of crushed stone to be used by the highway department. It bid $1.25 a ton for 2-in., 1-in., and ¾-in. stone at its yard and $1.50 delivered; $1.50 at the yard for ½-in. and $1.75 delivered; $1.70 at the yard for ¼-in. and $1.95 delivered; and 80c for stone dust at the yard and $1.05 delivered.

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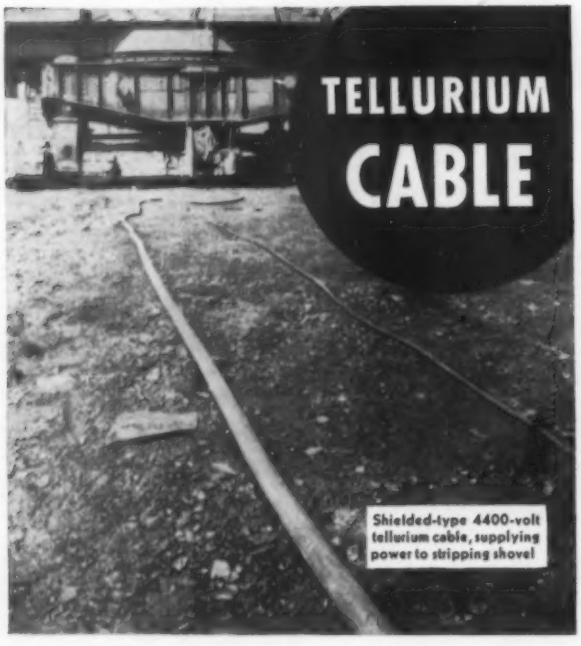
KANSAS CITY MO.: Frank Flinn Construction Co., Inc., was awarded contract for 500 cu. yd. base rock with a low bid of $1.20 a cu. yd. Centropolis Crusher Co. was awarded contract for 1000 tons, bidding $1.39 a ton for the east park district and $1.34 for the west park district.

Concrete Pavement Yardage

AWARDS of concrete pavement for July, 1940, have been announced by the Portland Cement Association as follows:

	Square yards awarded during July	Square yards awarded during first 7 months
Roads	3,405,825	22,500,504
Streets and Alleys	1,821,104	8,813,240
Airports	250,652	1,167,676
Totals	5,477,581	32,481,420



One Company a Steady User for 8 YEARS

EIGHT years ago we supplied an Indiana colliery* with some tellurium-rubber cable for electric shovels. Its performance over a long period proved its toughness. As a result, that coal-mining company has been using tellurium cable ever since. Many other mine owners have also discovered that tellurium cable saves money by cutting down on replacements, repairs, and costly holdups.

In detail this cable has been improved through the years, but essentially the design is one that has always given satisfactory service. It's tough, hard to cut, and stands up under rough usage.

Next time you need portable electric cable for shovels, cutters, loaders, drills, or motors, use tellurium-rubber and save money. Most sizes can be supplied by your jobber from stock. Or, to make absolutely sure of the right type and size for your particular job, call a cable specialist at the nearest G-E Office. General Electric Company, Schenectady, N. Y.

Name on request

GENERAL ELECTRIC INSULATED CABLE
ALWAYS THE RIGHT TYPE FOR EACH JOB

GENERAL ELECTRIC

NOT A PENNY FOR REPAIRS · · · NOT A SINGLE FORCED SHUTDOWN · · · *In 10 Months of Constant Operation!*

THESE two Gardner-Denver WBG V-belt driven compressors are working from 12 to 16 hours every day in a quarry operated by Pinnell & Pfost, in West Virginia. Both machines have been in constant operation for more than 10 months. During that time, not a penny has been spent for repairs or adjustments, and the only shutdowns have been for the regular oil change, which usually is made at every 120 hours of operation.

The remarkable economy of these Gardner-Denver compressors is shown by the fact that between oil changes, the compressors use only 1 quart of oil. Oil is added only infrequently, however, since the crankcase has sufficient capacity to make a 1 quart depletion scarcely noticeable.

Gardner-Denver "WB" motor driven, gasoline or Diesel engine driven compressors require little foundation. They are especially adapted to quarry work—built to cut power and maintenance cost for their owners! Complete information will be sent on request. Write! Gardner-Denver Company, Quincy, Illinois.

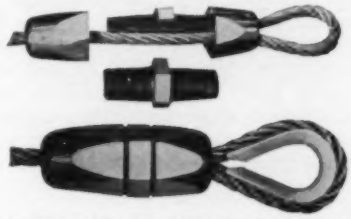
Gardner-Denver S-55 Sinking Drill used on this job.

GARDNER-DENVER
SINCE 1859

NEW MACHINERY * NEW EQUIPMENT

Safe Wire Clamps

NATIONAL PRODUCTION CO., Detroit, Mich., is marketing a wire rope clamp having several safety features. The inner surface which grips the wire



Disassembled and assembled views of wire rope clamp

rope is double spiral splined to fit each strand and wire of the rope, assuring a strong grip on each section of each wire. The gripping halves of the clamp are held tightly to the rope by taper threaded nuts. Stock sizes are for ropes ⅛-in. to ¾-in.

Speed Variator

THE GENERAL ELECTRIC CO., Schenectady, N. Y., has announced a complete speed-variator equipment operating from an alternating current

Horizontal motor-generator set for use as part of speed variator equipment

source of supply to provide wide ranges of adjustable speed by means of the well-known generator-voltage-control scheme. Each equipment consists of an adjustable-speed, d.-c. motor, an adjustable voltage motor-generator set with control, and a separately mounted generator - field rheostat. Standard speed ranges are available up to 16:1 ratio.

It is designed to permit the adjustable-speed, d.-c. motor to be mounted directly on the driven machine, with the speed-changing control mounted near-by. Units are designed to operate from 3-phase, 60-cycle, 220-, 440-, and 550-volt a.-c. power. The potentiometer-type generator-field rheostat provides speed changes in small increments over wide ranges.

The speed-variator equipment is applicable to material handling operations throughout the whole industrial field. Machine tools, pumps, and fans are other natural applications.

Air-Controlled Excavator

THE OSGOOD CO., Marion, Ohio, has developed an air-controlled power shovel, Model 800, for fast operation. All motions of the machine are controlled by air operated clutches, the air being supplied by a two-cylinder compressor driven from the end of the engine shaft. Controlling valves are of the metering type which permits the operator to apply the clutches at any speed that may be desired.

This model also is provided with an air operated swinging brake which can also be used as a traveling brake when the machine is moving into a new position. Steering is accomplished by means of air cylinders which disengage the steering clutches and engage brake bands. The dipper trip is operated by air and is controlled by a small lever at the operator's elbow.

The boom is of Man-ten steel, box girder type, all-welded construction. Shipper shaft is located above the center of the boom to give greater

Shovel in which hoisting and crowding are controlled by air cylinders

working ranges. The dipper sticks are of the outside type, and the crowding is of the independent chain driven type. The boom angle can be changed without adjustment of the crowd chain.

Reduce Length of Truck Mixer

CHAIN BELT CO., Milwaukee, Wis., has redesigned its line of truck mixers for greater capacity and faster loading. The capacity of the 2-cu. yd. Moto-Mixer is 104 cu. ft.; the 2½-cu. yd., 156 cu. ft.; the 4-cu. yd., 208-cu. ft.; the 5-cu. yd., 250 cu. ft., and the Rex "Metropolitan Special," 270 cu. ft.

The change in design has been made to take advantage of the increased carrying capacity of modern high speed trucks now available. Shorter over-all length of the truck mixer will make it possible to negotiate city streets or unimproved roads faster and easier.

One of the new features is a no-leak discharge door, which maintains true alignment with the drum at all times, and is operated from the mixer or from the ground by a non-creeping hand-wheel.

Larger capacity available in redesigned truck mixers

FINANCIAL NOTES

RECENT DIVIDENDS ANNOUNCED

Basic Dolomite	$0.12½	Sept. 16
Canada Cement Co., pfd.	1.25	Aug. 28
Florida Portland Cem. Co., pfd. (arrears June 30, $75.25)	3.50	Aug. 15
Monolith Portland Cem. Co., pfd.	.25	Aug. 15
(arrears July 1, $2.85)		
Schumacher Wall Board Corp., pfd. (arrears Aug. 16, $7.50)	.50	Aug. 15
National Gypsum Co., pfd.	1.12½	Sept. 3
Northwestern States Portland Cem. Co.	.40	Oct. 1
Ohio River Sand Co., pfd. (arrears Sept. 2, $40.00)	1.00	Sept. 1
Signal Mountain Portland Cem. Co., pfd. (arrears June 30, $60.00)	4.00	Aug. 15
Standard Silica Co.	.10	Aug. 15
U. S. Gypsum Co.	.50	Oct. 1
U. S. Gypsum Co., pfd.	1.75	Oct. 1

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NORTHWESTERN PORTLAND CEMENT Co., Portland, Ore., showed a net profit of $153,321 for the year ended December 31, 1939, after all charges. The company paid out $146,669 in dividends last year, including $8 a share on $6 preferred stock as current payment and clearing of arrears. Second preferred received its full 3 percent, and common stock was paid $1 a share. The company's plant at Grotto, Wash., was kept operating at capacity through nearly the whole year, principal shipments going to Grand Coulee dam.

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STANDARD SILICA CORP., Chicago, Ill., reported a profit of $21,137 for the six months ended June 30, 1940, as against $14,400 for the same period in 1939.

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SCHUMACHER WALL BOARD CORP., Los Angeles, Calif., reports a net income of $100,284 for the year ended April 30, 1940, as compared with a net profit of $136,951 in 1939, although there was a 12.3 percent increase in gross profit on sales. This result was brought about by the write-off of $107,572 on the abandonment of the company's old wall board plant and the purchase and erection of a modern plant which was placed in operation in November, 1939.

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UNITED STATES GYPSUM Co., Chicago, Ill., had a net profit of $7,784,448 for the 12 months ended June 30, 1940, as against $5,662,135 for a like period ended June 30, 1939.

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CONSOLIDATED SAND & GRAVEL, LTD., Toronto, Ont., Canada, has reported a net income of $9650 for the year ended March 31 as compared with a deficit of $5620 for the same period a year ago.

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NATIONAL GYPSUM Co., Buffalo, N. Y., reports a big increase in net sales for the six-months' period ending June 30, 1940, over the similar period in 1939, the 1940 sales amounting to $7,270,741 as against $6,075,234 in 1939. Net income for the six months this year was $607,636 as compared with $696,705 in 1939.

ALBERENE STONE CORP., of Va., New York, N. Y., a large talc producer, had net sales of $285,414 for the six months ended June 30, 1940. This compares with $235,845 the similar period in 1939.

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GIANT PORTLAND CEMENT CO., Philadelphia, Penn., has notified stockholders that dividend arears units and certificates for $5 par common stock are now ready for delivery in exchange for and upon surrender of 7% cumulative preferred and $50 par common stock certificates under terms of recapitalization plan which was approved by the stockholders, April 30, 1940. Holders of old preferred stock are entitled to receive in exchange for each share represented by their certificates a dividend arrears unit to the amount of $31.67 and 8 shares of $5 par common. Holders of $50 par common are entitled to new $5 par common on share for share basis.

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LONGHORN PORTLAND CEMENT CO., San Antonio, Texas, had a net profit of $328,748 for the six months ended June 30, 1940, compared with $335,541.

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FLORIDA PORTLAND CEMENT CO., Chicago, Ill., had a net profit before federal income taxes of $410,458 for the first six months of this year as compared with $215,422 for the same period in 1939. Net sales for the first half were $1,161,559 as against $780,-355 for this period last year.

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PACIFIC PORTLAND CEMENT CO., San Francisco, Calif., had an income account for the years ended December 31, 1939 and 1938, as follows:

	1939	1938
Net sales	$3,631,656	$3,153,579
Cost of sales	2,724,424	2,386,435
Selling, etc., expense	538,316	544,502
Operating profit	368,916	222,642
Margin of profit	10.16%	7.06%
Other income	30,804	37,748
Total income	399,720	260,390
Other deduction	44,638	34,978
Federal income tax	54,380	27,700
Net income	300,702	197,712
Preferred dividends	278,943	59,168
Surplus for year	21,759	138,544
Earning surplus, 1-1	73,163	② 1,436,671
Credits	———	93,883
Debits	———	1,595,935
Earnings surplus, 12-31	94,923	73,163
Earnings, preferred shares	$5.25	$3.34
Number preferred shares	57,389	59,168

Operating profit, after depreciation and depletion was $285,643 in 1938 and $227,887 in 1938.

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ARUNDEL CORP., Baltimore, Md., had a profit of $419,997, after charges but before federal income taxes, for the six months ended June 30, 1940, comparing with a profit of $677,814 in the first half of 1939.

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PENNSYLVANIA-DIXIE CEMENT CORP., New York, N. Y., reported the following consolidated earnings and sales for the twelve months ended June 30:

	1940	1939
Net sales	$6,570,291	$6,090,347
Cost, exp., etc.	5,164,805	4,936,184
① Depreciation and depletion	471,703	498,099
Oper. profit	933,783	656,064
Other income	28,126	31,806
Total income	961,909	687,870
Interest	378,254	423,384
② Net profit	583,655	264,486
Earn., pfd. share	$4.82	$2.18
No. of pfd. shares	121,200	121,200

① Additional depreciation charged to special reserve; 1940, $593,415; 1939, $775,413.

② Before Federal income taxes.

It also has been announced that the stockholders of the Pennsylvania-Dixie Cement Corp., at a meeting on August 9, approved the management's plan for refunding the company's 6 percent first mortgage bonds of 1941, totalling $6,069,000. A new first mortgage will be issued of $4,250,000, of which $3,250,000 would be taken by an insurance company. The bonds will bear an interest rate of 4½ percent. Approval also was given to create a $2,250,000 bank loan with interest at 3¾ percent.

Cement Production

BUREAU OF MINES reports as of July 27 that the portland cement industry in June, 1940, produced 12,514,000 bbl., shipped 13,216,000 bbl. from the mills, and had in stock at the end of the month 24,076,000 bbl. Production and shipments of portland cement in June, 1940, showed increases of 4.7 and 3.9 percent, respectively, as compared with June, 1939. Portland cement stocks at mills were 12 percent higher than a year ago. All plants reported.

In the following statement of relation of production to capacity, the total output of finished cement is compared with the estimated capacity of 160 plants at the close of June, 1940, and 161 plants at the close of June, 1939.

RATIO (PERCENT) OF PRODUCTION TO CAPACITY

	June		May	April	Mar.
	1939	1940	1940	1940	1940
The month...	56.4	58.9	58.0	47.5	36.3
12 months....	44.3	48.2	48.1	47.5	47.5

Final figures for 1939 show an output of 122,259,154 bbl. of portland cement, an increase of about 16 percent from 1938. This was the highest increase recorded since 1931, but represented a decrease of nearly 31 percent from the record high production of 1928. Shipments in 1939 amounted to 122,651,459 bbl., valued at $180,893,208, an increase of 15 percent in quantity and 17 percent in gross value. High-early-strength production totaled 3,751,331 bbl., and shipments amounted to 3,670,506 bbl., valued at $6,910,000, an average of $1.88 per bbl.

New Kansas Gravel Concern

RED ROCK GRAVEL CO. is the name of a new company with temporary offices at Smith Center, Kans. Company officers are: W. R. Lutz, president; L. E. Stahl, secretary; Joseph Lutz, treasurer; R. L. Leon, chief accountant; Ford L. Reed, purchasing agent; M. C. Butterfield, D. L. Critchfield, Kenneth Kirkpatrick, H. W. Shelley, and W. J. Weiss, technical advisors.

Installs Diesel

THE WAYNESFIELD BLOCK & TILE CO., Waynesfield, Ohio, has installed a 90-hp. Buckeye Diesel engine to operate its machinery which heretofore has been run by steam power. H. O. Thrush, manager, announced that other improvements will soon be completed and the plant started up.

Sand-Lime Brick Production and Shipments

EIGHT ACTIVE sand-lime brick plants reporting for July and ten reporting for June, statistics for which were published in August.

AVERAGE PRICE FOR JULY

	Plant Price	Delivered Price
Milwaukee, Wis.	$10.00	$12.00
Mishawaka, Ind.	11.00	....
Sebewaing, Mich.	10.00	....
Seattle, Wash.	14.50	16.50
Syracuse, N. Y.	14.00	....

STATISTICS FOR JUNE AND JULY

	†June	‡July
Production	1,987,107	1,990,750
Shipments (rail)	76,000	108,000
Shipments (truck)	2,423,566	2,403,774
Stock on hand	960,952	964,863
Unfilled orders	875,000	1,125,000

† Ten plants reporting: incomplete, one not reporting production, four not reporting stock on hand and seven not reporting unfilled orders.

‡ Eight plants reporting: incomplete, one not reporting production, two not reporting stock on hand, and three not reporting unfilled orders.

J. B. SUNDERLAND, president of Mutual Materials Co., Seattle, Wash., reporting on conditions in Seattle, writes that business looks healthy for at least the next nine months. His company has an ambitious program mapped out and quite a large government order to fill. A large part of the present production by the Paragon Plaster Co., Syracuse, N. Y., is being used for an addition to the American Can Co. at Fairport, N. Y.

Traffic and Transportation

PROPOSED RATE CHANGES—The following are the latest proposed changes in freight rates up to and including the week of August 17:

Central

62391. **Slag, crushed** or **crushed commercial** (not granulated), in closed cars, C. L. Establish on, from Hamilton, Ohio, to Charleston, W. Va., 209c per net ton.

62393. **Limestone, rough quarried,** not suitable for building purposes, C. L. Establish on, from Mier, Ind., to Dover, N. J., 418c per net ton.

62424 (a). **Limestone,** unburnt, agricultural, in bulk or in bags, in box cars, C. L., min. wt. 60,000 lb.; (b) **limestone, agricultural,** in bulk in open top cars, C. L. Establish on, from Danbury and Marblehead, Ohio, to St. Clair, Mich., (a) 171c and (b) 154c per net ton.

62425. **Limestone,** ground or pulverized, unburnt, C. L., min. wt. 60,000 lb. Establish on, from Lamson, Mich., to South Bend, Ind., 209c net ton.

62427. **Crushed stone and crushed stone screenings,** C. L. Establish on, from Logansport and Kenneth, Ind., to Anderson, Ind., 66c per net ton.

62443. **Stone,** crushed, **slag** or **gravel** coated with oil, tar or asphaltum (See Note 7), in open top equipment, C. L. Establish on, from Manistee, Mich., to Bessemer, 345c; Crystal Falls, 333c; Escanaba, 300c; Iron Mountain, 320c; Rockland, Mich., 375c per net ton.

62445. **Limestone,** ground or pulverized, C. L., min. wt. 60,000 lb. Establish on, proposed rates, in cents per net ton, to the following Kentucky points: (*From Greencastle, Ind. †From Bloomington, Ind.) Helena, 215*, 215†; Stanton, 237*, 215†; Slade, 237* 226†; Glencairn, 248*, 226†; Beattyville, 259*, 237†; Irvine, 237*, 226†.

62484. **Sand,** C. L., as described in W. T. L. Tariff 41Z. Establish on, from Ottawa-Utica, Ill., district to New Kensington, Penn., Col. A, 352c; Col. B, 387c; and Col. C, 352c per net ton, via present available routes.

62587. **Industrial sand,** per usual descriptions (a), (b) and (c). Establish on, from the Ottawa-Utica, Ill., dist. to Montreal, Que., Can., (a) 660c; (b) 686c, and (c) 660c per net ton.

62645. **Silica rock,** crushed(not ground or pulverized), in open-top cars, C. L. (See Note 3). Establish on, from Burnetts, O., to Alliance, O., 77c; Ashland, O., 110c; Cincinnati, O., 204c; Cleveland, O., 88c; Columbus, O., 149c; Dayton, O., 171c; East Liverpool, O., 105c; Galion, O., 127c; Hamilton, O., 193c; Lima, O., 160c; Mansfield, O., 116c; Marion, O., 138c; Middletown, O., 182c; Salem, O., 88c; Springfield, O., 171c; Zanesville, O., 138c per net ton.

62604. **Lime.** Cancel present rate of 12c on, from Kankakee, Ill., to LaFayette, Ind., published in Item 1035 of Agent Kipp's Trf. 15-S, and similar rates in individual lines' tariffs, classification basis to apply.

62647. **Silica rock,** crushed (not ground or pulverized), in open-top cars, C. L. (See Note 3). Establish on, from Burnetts, O., to Aliquippa, Penn., 121c; Erie, Penn., 1932c; Farrell, Penn., 99c; Johnstown, Penn., 165c; Monoca, Penn., 110c; Steelton, Penn., 262c; Weirton, W. Va., 143c; Buffalo, N. Y., Lackawanna, N. Y., 165c, and Sparrows Point, Md., 297c per net ton.

62682. **Slag,** crushed (not granulated), the product of iron or steel furnaces,

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Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

Note 4—Reason: No present or prospective movement.

Note 5—Reason: Comparable with rates from other origins in immediate vicinity.

Note 6—Rates will not apply on shipments in cars with tarpaulin or other protective covering. In such instances the rates applicable on shipments in box cars are to be assessed.

Note 7—The oil, tar or asphaltum not to exceed 10% of weight of the commodity shipped, the shipper to so certify on shipping order or bill of lading.

C. L. Establish on, from Weirton, W. Va., to Charleston, W. Va., 198c net ton, via P. R. R.-Wheeling and B. & O. R. R.

62657. **Crushed stone,** in open top cars, C. L. Establish on, from New Vienna, O., to Nelsonville, O., 127c per net ton.

62683. **Limestone,** crude (not suitable for concrete purposes), C. L. Establish on, from Durbin, Ohio, to Findlay, Ohio, 99c; Fremont, Ohio, 114c; Ottawa, Ohio, 95c per net ton.

62686. **Sand** (other than industrial) **and gravel,** in open top cars, without tarpaulin or other protective covering, C. L. Establish on, from New Martinsville, W. Va., to Confluence and Somerfield, Penn., 143c net ton, via B. & O. R. R. direct.

62713. **Industrial sand** as per Descriptions (a), (b) and (c). Establish on, from Ottawa, Ill., district to Proctor, Vt., (a) 528c; (b) 576c and (c) 528c net ton.

62919. **Crushed stone,** in bulk, in open top cars, C. L. Establish on, from Osgood, Ind., to Harrison, O.-Ind., 94c per net ton, via B. & O.-North Bend, O.-Big Four Ry.

Trunk

38778. **Slag,** C. L. (See Note 3), from Sparrows Point, Md., to W. B. & Pt. L. R. R. Stations, Hughesville and Brandywine to Gallant Green, Md., 143c per net ton in lieu of current commodity rate of 171c per net ton. (See Note 4.)

38843. **Blocks, building** (except ornamental or decorative), made of ashes, cement, cinders, concrete, gravel, sand or slag (not reinforced with metal), except enameled, individual blocks not being packed, C. L., min. wt. 60,000 lb., Rule 24 of Official Classification not to apply, from Neville Island, Penn., to Beaver Falls, New Brighton and Ambridge, Penn., 116c and to Donora and Charleroi, Penn., 170c per net ton in lieu of current 6th class rates. (See Note 5.)

38850. **Slate dust,** C. L., min. wt. 60,000 lb., from Slate Hill, Penn., and Whiteford, Md., to Zelienople, Penn., $3.30 per net ton in lieu of current rate of 28c per 100 lbs. (See Note 5.)

39000. **Sand** (not industrial) **and gravel,** C. L. (See Note 3), except when in containers loaded on container cars, min. wt. will be 110,000 lb., from Pulaski, N. Y., to Montreal, Que., 292c per net ton in lieu of current 6th class rate of $6.00 per net ton (See Note 5).

Southern

22222. **Sand, gravel, crushed stone and related articles,** C. L. Establish 150c net ton from Montgomery, Ala., to A. C. L. R. R. stations, viz.: Acree, Poulan, Sumner, Ty Ty, Taylor's Still (Gibb, Kirkland and Pearson, Ga.

22226. **Bituminous rock,** C. L. Establish 605c net ton—Big Clifty, Black Rock, Bowling Green, Litchfield, Rockport and Summit, Ky., to West Palm Beach, Fla.

22266. **Sand, gravel and crushed stone,** C. L. Establish 50c net ton—Spruce Pine and Rockwood, Ala., to Emco, Ala.

22421. **Lime,** common, hydrated, quick or slack, C. L., min. 70,000 lb. Establish 110c net ton—Calera, Newala and Roberta, Ala., to Birmingham and North Birmingham, Ala. Truck competitive. Expires June 30, 1941.

22422. **Crushed stone, sand, gravel,** C. L. Establish to St. Stephens, S. C., from Wateree and Wateree River, S. C., 90c and from Blair and Rockton, S. C., 120c; to Pinopolis Junction, S. C., from Wateree River, S. C., 90c and from Rockton, S. C., 120c net ton. Water competitive. Expires Dec. 31, 1940.

22722. **Crude phosphate rock,** C. L. Establish 750c gross ton from origins named in A. C. L. R. R. I. C. C. B2960 and S. A. L. Ry. I. C. C. A7915 to Chicago, Ill. Water competitive.

22786. **Mica,** ground or pulverized, C. L., min. 40,000 lb. Establish to Pacific coast and intermediate points from Southern points in Group K 154c, Group L 138c, and Group M 130c cwt.

22884 (shippers; suggested by carriers). **Phosphate rock,** crude or ground, C. L. Establish 600c gross ton—Florida mines to Hagerstown, Brunswick, Md., and Alexandria, Va.

Rate Adjustment in Chemical Lime

THE I.C.C. on further hearing in No. 27469, Virginia Lime Products Co., Inc., vs. Chesapeake & Ohio, has modified findings in the prior report. This held the rates on chemical lime from Eagle Mountain, Va., to Charleston, W. Va., to be unreasonable, but that the failure of the defendant to establish lower rates was unreasonable. The finding now is that the rate of $3.02 a net ton, min. 30,000 lb., in effect prior to April 3, 1936, was unreasonable to the extent it exceeded $2.80 min. 30,000 lb.; that the rates of $2.80, min. 30,000 lb., and $2.20, min. 50,000 lb., which were established April 3, 1936, were and are not unreasonable; and that the defendant's failure to establish the 70 percent basis on April 3, 1936, was not and is not unreasonable.

To Recover Gold In Gravel

THE GRAVEL PROCESSING CO. of Idaho has started operations near Weiser, Idaho, on the Snake river, according to M. W. Grady, who is in charge of the work. Gravel processing equipment has been installed, and machinery to recover the gold "flour" will be obtained later.

OBITUARIES

ROBERT S. CAMPBELL, owner, president and general manager of the Campbell Limestone Co., Inc., Strawberry Plains, Tenn., died July 18 at the age of 52. Coming to South Carolina in 1906 as a construction superintendent for the Clinchfield railroad, he entered the quarry business in 1920. Mr. Campbell was formerly vice-president of the Holston Quarry Co., Knoxville, Tenn., which he purchased and consolidated with the Campbell company and also was interested in a number of other concerns.

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STEPHEN BIANCHI, treasurer of the Bianchi Cast Stone Co., Milton, Mass., died July 17. He was 75 years of age and had been engaged in the monumental stone business in his earlier years. When the cast stone industry was in its infancy, he foresaw its possibilities and entered the new industry, becoming one of its pioneers.

•

D. S. MOONEY, president of the Mooney Sand & Gravel Co., Atlanta, Ga., died July 31 at the age of 59. He was also president of the D. S. Mooney Construction Co.

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ELLIS W. REED-LEWIS, well known in the cement industry and a member of Committee C-1 on Cement of the A.S.T.M., died recently at the age of 55. At one time he was research engineer for the Super Cement Co., and in 1934 he established his own research laboratory in Detroit.

•

JOHN K. CHALMERS died July 20 at the age of 78. For many years he had been associated with the Carl Leonardt Construction Co. and also in an executive capacity with the Southwestern Portland Cement Co., Los Angeles, Calif., in its early years when Carl Leonardt founded it.

•

LAWRENCE C. LETZKUS, sales manager of the Columbia Cement Division, Pittsburgh Plate Glass Co., was killed recently in the tragic head-on collision of a freight train with a rail coach near Akron, Ohio.

New Incorporations

Concrete-Mix, Inc., 13th and Elm streets, Muncie, Ind., has been granted a charter. Capital is 250 shares of $100 par value each and incorporators are F. E. Schouweiler, George L. Kempf and R. F. Miser.

Foundation Sand and Gravel Co., Queens, N. Y., has been incorporated with a capital of $10,000. Incorporator is Geo. Naiman, 38 Park Row, New York City.

Springfield Sand & Gravel Co., Inc., Springfield, Ore., has been granted a charter with a capital of $40,000. Incorporators are W. H. Jewitt, Louis Johnson and Wilson Jewitt, Jr.

Mad River Talc Corp. of Waitsfield, Vt., has filed articles of incorporation, with capital stock of 100 shares pfd., and 100 shares common stock, both with par value of $100 a share. Subscribers are Agnes Costello, Robert H. Spelman and Harry M. Kelley, all of New York City.

Redi Mix Concrete Co., Miami Beach, Fla., has been granted a charter with a stock of 50 shares no par value. Directors are Louis Heiman, Dave Hendrick and Edythe Prelich.

Colonial Concrete Products Corp., Norfolk, Va., has been granted a charter with a maximum capital of $50,000. D. A. Decker is president and Clair E. Crawford, 115 College place, Norfolk, attorney.

Premixed Concrete Co., 11 S. LaSalle St., Chicago, Ill., has been incorporated. Capital is 50 shares common par value at $100 a share and incorporators are V. Neumark, S. L. Edelstein and J. Stein. Correspondent is Lee and Neumark, 11 S. LaSalle St., Chicago.

Patterson Limestone Products Co., Inc., New York, N. Y., has been granted a charter with 100 shares no par value. T. C. P. Martin, 70 Pine Street, New York City, is incorporator.

Payton R. Turner Co., Inc., with principal office at Rosehill, N. C., has been granted a charter to manufacture, mix and sell lime and lime products. Authorized capital stock is 1000 shares no par value and subscribed stock is three shares. Incorporators are Peyton R. Turner, J. M. Cottle and Latham A. Wilson.

A. H. Smith Concrete Co., Branchville, Md., has been granted a charter with a capital stock of 500 shares, each having a par value of $100. Incorporators are A. H. Smith, David J. Breerwood and Allen Thrift.

Reading Sand Co., Camden, N. J., has been incorporated. Capital is 1000 shares no par value and agent is Arthur Lewis.

Manufacturers' News Notes

Chicago Perforating Co., Chicago, Ill., is making an expansion of its manufacturing facilities, including the addition of several new presses.

Robins Conveying Belt Co., Passaic, N. J., reports the death of William L. Fewsmith, manager of publicity and advertising. He joined the company in 1913 and had been employed as a civil and mechanical engineer until 1924 when he was appointed head of the publicity and advertising departments.

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., has available for bookings a new sound motion picture about the nature, manufacture and uses of synthetic rubber-like material. It is a 16 mm. film.

Classified Advertisements

CLASSIFIED RATES

POSITIONS WANTED — POSITIONS VACANT—Set in six-point type. Minimum $1.00 each insertion, payable in advance.

INFORMATION—Box numbers in care of our office. An advertising inch is measured vertically in one column. Three columns, 30 inches to the page.

CLASSIFIED — Displayed or undisplayed. Rate per column inch, $5.00. Unless on contract basis, advertisements must be paid for in advance of insertion.

CONSIDER THESE CONSOLIDATED VALUES!

AT CASTALIA, OHIO

8'x125', 6'x120' and 6'x60' ROTARY KILNS.
4—DIRECT HEAT ROTARY DRYERS; 4'6x50', double shell; 4x60', 6x60'.
2—5'x10' BONNOT BALL MILLS, steel lining, with motors.
2—5'x22' TUBE MILLS, silex, with motors.
1—8'x30" HARDINGE CONICAL BALL MILL, iron lined, with motor.
3—5'x27' TUBE MILLS, silex, with motors.
1—12' dia. DRY GRINDING PAN.
3—13 ton STEAM LOCOMOTIVES, Vulcan and Porter, 36" ga.
150—1½ yd. two-way STEEL DUMP CARS, 36" ga.
1—5 ton TRAVELING CRANE, 70' span, 200' long.
4,300 Horsepower in ELECTRIC MOTORS, all 3/60/440 volt; included are 9—150 H.P. and 6—200 H.P. Slip Ring Motors, 585 RPM.

SYMONS CONE CRUSHERS
2 ft. and 7 ft., each with fine bowl.

GYRATORY FINISHING CRUSHERS
1'8" and 2'4" Traylor TY; 410-TZ, 4' Traylor; No. 19, 25, 37 and 49 Kennedy.

GYRATORY CRUSHERS
36" Allis-Chalmers Style "N," short shaft; 30" Allis-Chalmers Superior McCully; 42" Gates; 20" Kennedy Gearless; 20" Traylor; 20" Allis-Chalmers Superior McCully; 15" Telsmith; 13" Superior McCully and smaller sizes.

JAW CRUSHERS
30x42" Buchanan Type "C"; 48x42 Traylor Bull-dog; 66x36 Traylor; 48x60 Traylor; 36x24 Farrel; 18x36 Farrel; 24x36 Allis-Chalmers; 8x36 Universal Roll Jaw; 18x30 Allis-Chalmers and smaller sizes.

ROTARY KILNS
9'x100', 8'x150', 8'x125', 8'x100', 6'x120', 6'x60'.

ROTARY DRYERS—Direct Heat
Ruggles-Coles, double shell; 5'x26', 5'x30', 5'6x60', 80"x45', 104"x60', 104"x85', Single Shell; 4'x30', 5'x30', 6'x40', 6'x50', 6'x60', 8'x60', 8'8"x85'.

CENTRIFUGAL AIR SEPARATORS
10' Sturtevant; 8', 10', 12' Gayco; 6' Raymond; also 5' dia. Raymond "Whizzer" for attachment to roller mill.

RAYMOND PULVERIZERS
2 roll and 3 roll High Side—4 and 5 roll Low Side; No.'s 0000, 00, 1 and 3, Beater type—Also No.'s. 55, 60, 90 Imp type, also No. 40 Imp with 6' Centrifugal Separator.

HARDINGE CONICAL BALL MILLS
3'x8", 5'x22", 6'x22", 7'x22", 8'x20", 8'x72".

BALL, ROD AND TUBE MILLS
Ball Mills: 3'x5', 5'x10', 6'x6', 6'x8'.
Rod Mills: 4'x8', 6'x12' Hardinge, straight side; 5'x10', 5'x12' Allis-Chalmers.
Tube Mills; 3'x12', 4'x16', 5'x20', 5'x35'.

VIBRATING SCREENS
Tyler Hummer 3'x5', 4'x5' 1 and 2 decks; 4—4'x7' Leahy, two deck; 4'x8' Huron, 1 deck; 3—4'x7' Jeffrey-Traylor, 2 deck; Symons 4'x10' 4'x12' 5'x10' 2 deck. Also Rotex, Robinson and other makes.

AIR COMPRESSORS
2—Sullivan Type WN-102, two stage, 550'. New 1939.
2—Ingersoll-Rand 80-CH, two stage, air cooled, electric driven on skids, 360 CFM, 1939.
1—Ingersoll-Rand 315-A Portable.
2—Ingersoll-Rand 830 cu. ft. air cooled, electric driven, 100 lbs., 1939.
1—Chicago Pneumatic OCE 20x12x14; synchronous motor.

SHOVELS AND CRANES
1—2 yd. Lima Shovel, Model 850, with Caterpillar Diesel D-17,000 Engine, 1937.
1—1½ yd. Lorain Shovel "79," double chain drive, Caterpillar trucks, D-13,000 Caterpillar Diesel Engine. Built late 1939.
1—2 yd. Marion, No. 38, Comb. Shovel and Crane, Buda Diesel, 1937.
1—No. 37B 1½ yd. Bucyrus-Erie Dragline, new 1939. Caterpillar Diesel motor.
1—Bucyrus-Erie 48-B, Diesel driven Shovel, 2 yd. 1937.
1—Northwest 2½ yd. Diesel driven Shovel, full revolving, 1937.
1—10-B Bucyrus Erie Gasoline Shovel, ⅝ yd. 1939.
1—Bucyrus-Erie 2 yd. 50-B steam driven Dragline Crane, and Shovel. Aluminum dragline boom and little used shovel front.
1—Truck Crane "Universal" 7½ ton.

LOCOMOTIVES
2—Diesel driven 8-ton, 36" ga. Locomotives, D-4400 Diesel motors.
2—Diesel driven 4½ ton 36" ga. Locomotives, Buda Lanova motors.
3—18 ton Steam Locomotives, Vulcan and Porter, 36" ga. Near Cleveland, Ohio.
2—Plymouth Std. Ga. Gasoline 20 ton and 24 ton Locomotives.

CONSOLIDATED PRODUCTS CO., Inc., 15-16-17 Park Row, New York, N.Y.
Our Shops at Newark, N. J., cover eight acres

REAL TRUCK MIXER BARGAINS

Seven Jaeger 1½-2 yd. Truck Mixers mounted on Model EH "Baby Mack" trucks. Used less than 2 seasons; replaced with larger units. In excellent condition, ready to work. Will sell separate or on trucks, at tremendous saving in price.

Write or Wire for Details

J. C. LEMBO
c/o The Jaeger Machine Co.
COLUMBUS, OHIO

CONVEYORS: 14-36" Belt-Idlers-Pulleys.
30" & 36" Steel Frame 24' Belt Sections.
14"x40' and 16"x20' Portable Belt Units.
BUCKET ELEVATORS: 36"-w. H & T Assembly 16"x60'—14"x42' & 45', 10"x40',—8"x25'—5"x36' & Others.
Buckets, Chains, Belts, Drives, Casings.
CRUSHERS: 10x4—15x9—16x9—20x10—18x12—24x36—28x36 Jaw Types.
12" Traylor Gyratory & 16x42 A-C Rolls.
No. 2 Williams 'Semi-Vulcanite' Hammermill.
VIBRATING SCREENS: 6 Hummer 4x8 1-deck 2-unit Types, V-16.
4x5 Hummer Vibrating, V-16 & V-40 Heads.
120 New 3x5 & 4x5 Hummer Toncap Frames.
12 KVA Motor Generator For Hummers.
2x8 Link-Belt 1-deck Vibrating Type.
3x5 Deister 'Multirap' 1-deck Vibrating.
42"x20' Revolving and 30" Grizzly Types.
CONT'R'S. EQUIP'T.: No. 40 Cletrac Tractor.
50 & 60-HP. Waukesha & 30-HP. Engines.
15 Centrifugal Water Pumps, Gas & Elec.
15 hp. Continental & 9 & 5-hp. Engines.
G. A. UNVERZAGT, 15 Park Row, New York City

Cars You Have Been Looking For!
90 to 100
Clark G-6, *30-Yard* 50-Ton Air Dump Cars, *down-turning door* type.
Extra heavily constructed. Floor Plates ½" Steel Wheels.
Cheaply priced. Act before too late!
IRON & STEEL PRODUCTS, INC.
13492 S. Brainard Avenue
Chicago, Illinois
***"Anything* containing IRON or STEEL"**

Used Equipment for Sale

12'x12'x20' high oversize hopper, sloping grizzly
20' and 22' bucket elevators
24"x10'0" two-deck shaker screen
20"x10'x0" shaker screen
Model No. U-40 Allis Chalmers engine
4" Sterling sand pump No. 3558
60"x20' Revolving screen—structural frame, portable
10"x20"—10"x36" and 15"x36" DIAMOND Roller Bearing Jaw Crushers

New Equipment
9"x16" DIAMOND crusher—truck mounted with engine
No. 20 Diamond portable crushing and screening plant
2—10"x20" portable crushing and elevating plants
Special prices for quick sales

DIAMOND IRON WORKS, INC., AND MAHR MANUFACTURING COMPANY DIV.
MINNEAPOLIS, MINNESOTA

FOR SALE

KILNS:—6' x 36', 8' x 125', 8' x 150'.
DRYERS:—3'6" x 24', 5' x 40', 5' x 50'.
BALL MILLS:—5' x 8', 6' x 8', 5' x 22'.
HARDINGE MILLS:—4½' x 16", 5' x 22", 6' x 22".
RAYMOND MILLS:—No. 0000, No. 00, No. 1, No. 3, 3 Roll, No. 55 Imp.
HAMMER MILLS:—Jeffrey, 30" x 24"; Williams, Gruendler, etc.
MISC.—4—100 HP Boilers, Bucket Elevators, Lime Kilns, Pipe, Tanks, etc., located New Mexico. Send for bulletin.

BRILL Equipment Corporation
183 Varick St., N. Y. C.

24" x 36" Traylor Jaw Crusher
24" x 36" Farrell Jaw Crusher
18" x 36" Farrell Jaw Crusher
18" x 36" Buchanan Jaw Crusher
20" Traylor Gyratory Crusher
2'4" Traylor Gyratory Crusher
1'8" Traylor Gyratory Crusher
10-20 Good Roads Roller Bearing Jaw Crusher
16" x 36" Buchanan Rolls
5X Gruendler Hammer Mill
Jeffery Hammer Mill
495' of New 36" 7 Ply Conveyor Belt
553' of New 18" 4 Ply Conveyor Belt

BLUE BALL MACHINE WORKS
BLUE BALL PENNA.

"WE BUY, REBUILD, SELL OR RENT"

AIR COMPRESSORS
Portable and stationary, belt with elec. or gas power, sizes from 20 cu. ft. to 1,800 cu. ft.

BINS
9—2 compartment bins; 2—118 ton Blaw Knox; 1—75 ton Butler V-40; 3—72 ton Blaw Knox; 1—60 ton Butler V-40; 1—35 ton Blaw Knox portable; 1—26 ton Heltzel portable with Kron dial scale. All above with or without volume or weigh batchers.

BUCKETS
25—Clamshell, all sizes and types; Williams, Blaw Knox, and Owen.
6—Dragline: 1—1¾ yd. Northwest; 1—1½-yd. Omaha; 1—1¼ yd. Page; 2—1 yd. Hayward; 1—¾ yd. Page.
1—1½ yd. Pioneer Cableway Excavator bucket.
7—Dragscraper: 2—1 yd. Sauerman; 1—1 yd. Green; 1—⅝ yd. Garst; 2—½ yd. Garst.

CRANES, DRAGLINES & SHOVELS
1—Link Belt Mod. K-55 combination dragline and shovel Ser. No. 1698, gasoline power, 70 dragline boom, 2 yd. shovel frame.

SPECIAL OFFER
1—Blaw-Knox 120 ton lev. cap. 4 compartment steel bin with extra 100 barrel cement compartment dial scale for weighing 2 yd. batch and separate dial scale for weighing bulk cement, complete with Fairbanks-Morse water weighing device.

1—Page, Model No. 411 Diesel crawler dragline, 70' boom, 2 yd. bucket.
1—P & H Model No. 650, Serial No. 4188, 65' boom; 1¼ yd. bucket.
1—Link-Belt K-42, combination shovel crane and trench hoe. Serial No. 1265, 1½ yd. shovel front, 60' crane boom.
3—Northwest, Model No. 105, Serial Nos. 2053, 1645 and 1522, 40' boom, 1 yd. bucket.
1—Link-Belt, K-1, Serial No. 1024, 50' boom, 1 yd. bucket.
2—Osgood Heavy Duty, Serial No. 2069 and No. 2087, combination 1 yd. shovel and crane, 40' boom.
1—Thew, Model "O" combination shovel crane and dragline, Serial No. 2801 and No. 2687, ¾ yd. shovel fronts, 40' crane boom.
1—P & H Model No. 206, 40' boom, ¾ yd. bucket.
1—Byers Bearcat, Serial No. 3299, 30' boom, ⅜ yd. bucket.

CRUSHERS
5—Gyratory crushers: 1—No. 5 Allis-Chalmers; 1—No. 5 Austin; 1—No. 5 Gates; 1—No. 3 McCully; 1—No. 0 McCully.
10—Jaw Crushers: 3—15x36" Universal; 1—15x36" Cedar Rapids; 1—15x26" Champion; 1—12x20" Acme; 2—10x20" Climax No. 2½; 1—9x16" Telsmith No. 9A; 1—9x15" Champion.
1—Set of Allis-Chalmers, smooth type crushing rolls, 42x16".

DREDGE PUMPS
1—12" Morris Heavy Duty D. C. to 100 H.P. dbl. cyl. steam engine.
3—Belt Driven: 3—Morris Mang., 1—10", 1—8", 1—6".

HOISTS
1—2 Yd. Thomas 2 speed Class L Cableway excavator hoist with 150 HP electric motor.
1—National 50 HP dragscraper hoist for handling 1 yd. bucket with 50 HP electric or gas power.
1—1 Yd. Cedar Rapids 2 speed dragscraper hoist with 30 HP electric or gas power.
1—1 Yd. Kern variable speed dragscraper hoist powered by 50 HP electric motor.

PNEUMATIC TOOLS
4—Ingersoll-Rand & Gardner Denver Wagon Drills with I-Rx72 or Gardner Denver Mod. 21 Drills and air hoists.
53—Jackhammer drills: I.R. DCH-23 & 8-49 and Gardner Denver, Mod. 37 & 11-D.
17—Drifters, column mounted: 7, Sullivan TJ-10; 4—Gardner Denver Mod. 17; 6—I.R. 72.
3—Drill sharpeners: 2—Sullivan late Mod. Class C and Class A; 1—I.R. 50.

WHIRLEY
1—Mod. 75 Wiley Whirley No. 2973, 20 tons cap., 75' boom, 3 D Clyde 80 HP elec. hoist and 30 HP elec. swinger, all complete. Perfect condition.

PLEASE SEND FOR A COMPLETE STOCK LIST

EQUIPMENT CORPORATION OF AMERICA

PHILADELPHIA—1506 Race St. Phone: Rittenhouse 4664
CHICAGO—1119 So. Washtenaw Ave. Phone Nevada 2400
PITTSBURGH—P. O. Box 933, Phone Federal 2000

LOCOMOTIVES SHOVELS — CRANES

Attractive Prices

1—80 Ton American 0-6-0 Switcher.
1—75 Ton Baldwin 0-6-0 Switcher.
2—40 Ton American Saddle Tanks.
1—38 Ton Vulcan Saddle Tank.
1—38 Ton Porter Saddle Tank.
2—25 Ton Plymouth—Gasoline. Standard Gauge—Rebuilt

1—Marion 480 Combination Steam Shovel and Crane.
1—52-B Bucyrus Dragline 70 ft. Boom, Atlas Imperial Diesel Engine.
1—25 Ton Browning 8-C Steam Locomotive Crane.

Birmingham Rail & Locomotive Co.
BIRMINGHAM, ALA.

NEW AND USED PIPE FOR EVERY PURPOSE

Large stocks carried everywhere for spot shipment

Jos. Greenspon's Son Pipe Corp.
National Stock Yds. (St. Clair Co.) Ill.

ELECTRICAL MACHINERY

Motors and Generators, A.C. and D.C., for sale at attractive prices. New and Rebuilt. All fully guaranteed. Write for List and Prices.

V. M. NUSSBAUM & CO.
Fort Wayne, Indiana

CRUSHERS

GYRATORY: 42" McCully with 80% brand new parts. 36" Allis-C. 20" Super. McCully conv. to 16". Gates Nos. 10, 9, 8, 7½, 6, 5, 4, 3, 2, 1 (75 avail.) Telsmith Nos. 4, 5, 6, 9C, 9 & 16. Also Many Austins, Kennedys and Traylors, many sizes.

JAW TYPE: Traylor 60x84, 48x60, 42x48, 24x72, Superior 84x66 & 24x36. Buchanan 30x42. Farrel 60x42, 30x36, 24x36, 18x36, 12x24. Good Roads 1030. Acme 24x40. Misc. 7x12, 9x16, 8x20, 8x24, 12x24, 9x36, 9x30, 15x36.

REDUC. TYPE: Kennedy Nos. 25, 37 & 49. Telsmith 2-F & 40. Traylor 36" TX, 8", 10", 12" Super. McCully 6" & 10". Newhouse 5, 7 & 10". Symons Cone & Disc Ty. 2' to 4'.

ROLLS: Allis-C. 12½x12, 36x16, 40x15, 54x24 & 72x30. Fairmount 36x60 & Jeffrey 24x24 to 36x54 single roll. Cornish 36x14 & 42x16, Etc., Etc.

HAMMERMILLS: Williams No. 1, 2, 3, 4, 8 & 9. Jeffrey 36x18 & 36x42. Day Nos. 20 & 40, Etc.

MILLS: Kennedy Ball 4x6, 5x8 & 5x8. Marcy 9x6 & 10x9. Hardinge 6'x3', 8'x30' & 6'x9'. Misc. Tube Mills 5' & 6' x 22'. Sturtevant Ring Roll, Raymonds, Kents, Fuller-Lehigh, Etc., Etc.

CRUSHING PLANTS: No. 65 Diamond. No. 22 Pioneer 8x24. 1030 Good Roads, 9x40 Austin-Western, 9x36 C.B.

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906 "	24"	5	1/8"	1/32"	"
298 "	24"	4	1/8"	1/16"	"
370 "	22"	8	1/16"	1/16"	Elevator
296 "	22"	8	Friction		"
1455 "	20"	5	1/8"	1/32"	Conveyor
403 "	20"	4	1/8"	1/16"	"
1738 "	18"	4	1/8"	1/32"	"
60 "	18"	8	1/4"	1/16"	Elevator
288 "	18"	6	1/8"	1/16"	"
712 "	18"	4	1/16"	1/16"	Conveyor
1096 "	16"	4	1/8"	1/32"	"
554 "	16"	4	1/16"	1/32"	"
738 "	14"	4	3/32"	1/32"	"
288 "	14"	4	1/8"	1/16"	"
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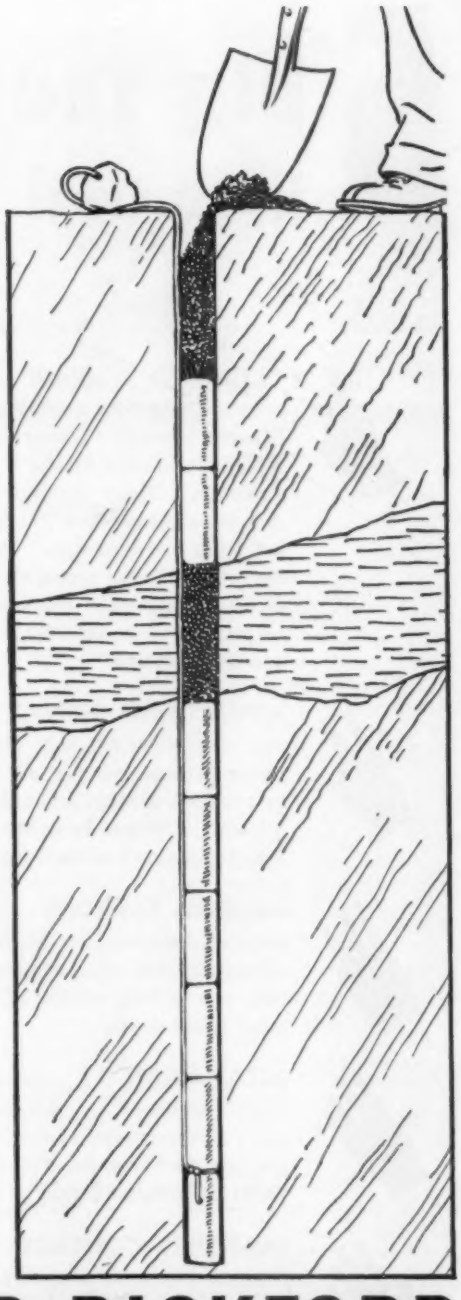
SEPT. 18, 19, 20 . . . DETROIT . . . HOTEL STATLER

"STEM" AND TAMP *right*



Any explosive does its best work when strongly confined. Stemming material should be free from stones or sharp particles. For deep well-drill holes, dry free-running sand is generally satisfactory. Moist sand, loam, or clay is recommended for shallow vertical holes, jackhammer holes and holes in the face.

In loading well-drill holes, the Primacord should be cut off the spool and secured with a stone at the mouth of the hole. If stemming material is shoveled into the mouth of the bore hole, be careful not to cut the Primacord with the shovel!

For small holes, the tamping stick should be of wood, with a flat end. Just enough force should be used to press the stemming material firmly into the hole.

Send for the Primacord Booklet—it's free.

Illustration shows a typical deckload, with explosive charge located in the rock and stemming material in the soft strata. Notice that the Primacord is in contact with each cartridge in both loads—no detonators are needed.

PRIMACORD·BICKFORD

Detonating FUSE

THE ENSIGN-BICKFORD CO., Simsbury, Conn.

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PB24

1. Tie through cartridge.
2. Half hitch branch to main line.
3. Connect main line lengths with square knot.
4. Fuse and cap on end of main line.

IMPORTANT: Branch lines should lead away from main lines at *right angles*. Avoid kinks and small loops.

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